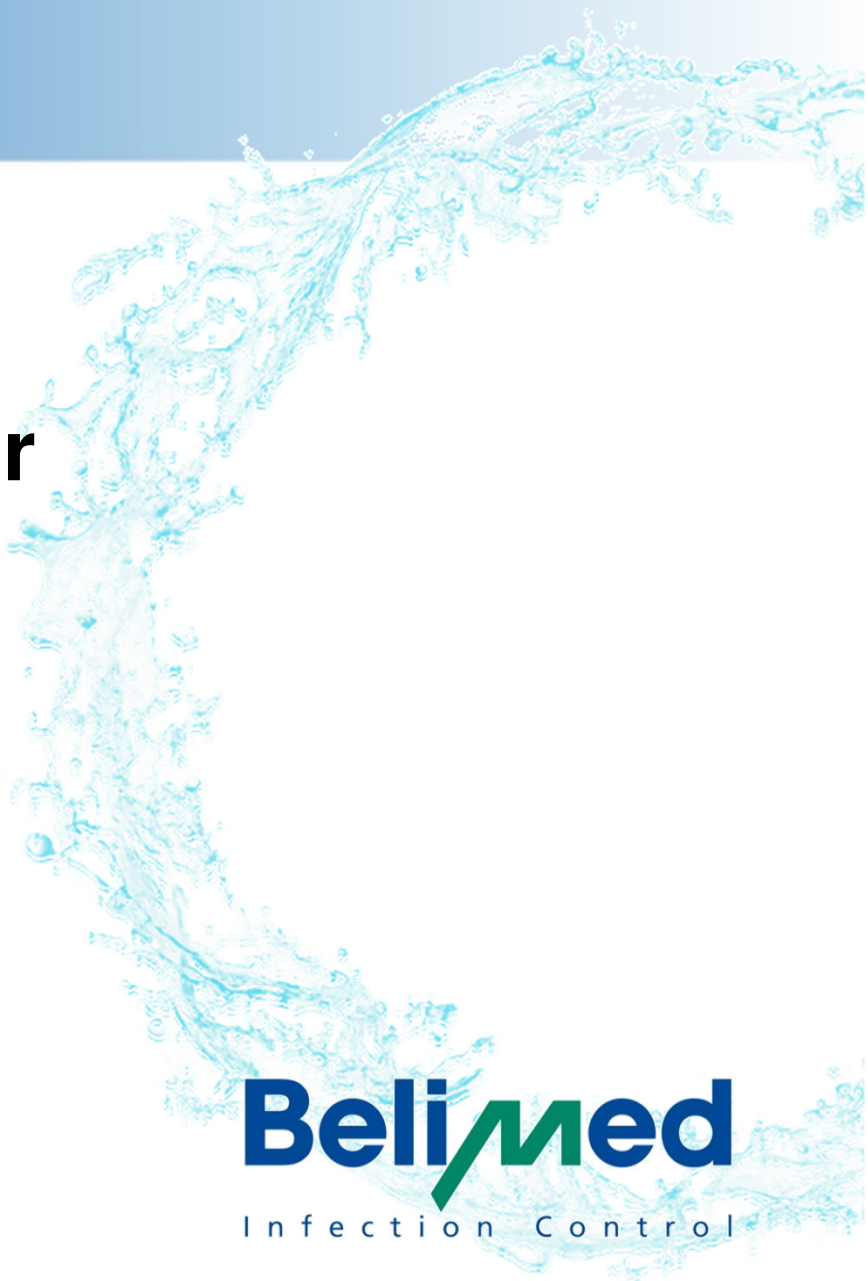
Washer Disinfector

Service Training Seminar

Belimed US Charleston, SC



WD 230

- Manual doors in stainless steel or with glass door
- Pass trough model or one door model
- Microprocessor controlled
- Electronic water level control during filling process depending of chamber loading (reduce water consumption)

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WD 250

- Automatic vertical glass door
  - Door opens down
- Use the same rack as the 230.

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WD 290

- **15-tray washer-disinfector with automatic glass sliding doors**

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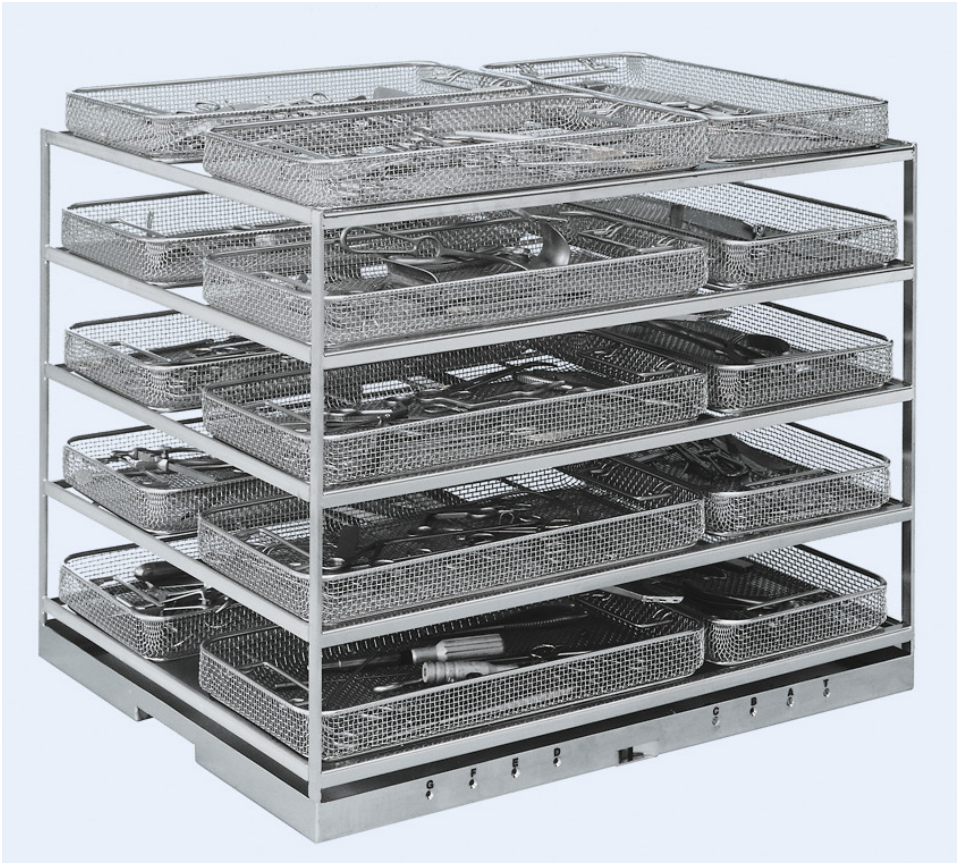
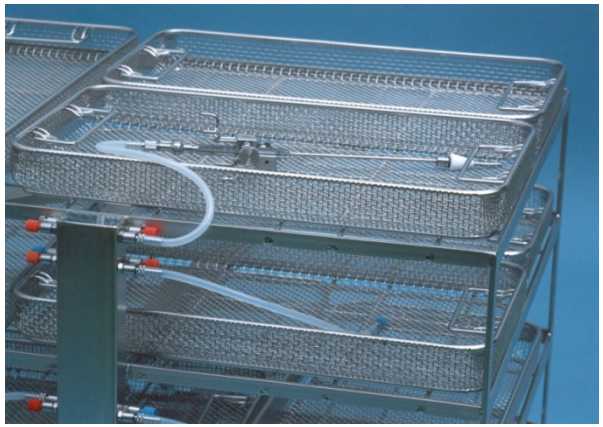
Accessories instrument racks





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Course objectives

- Discuss cleaning theory
- Describe a basic wash program
- Understand the fluid flow paths
- Interpret electrical schematics
- Identify key components
- Identify normal menus
- Access service mode
- Troubleshoot fault codes and errors
- Review maintenance procedures

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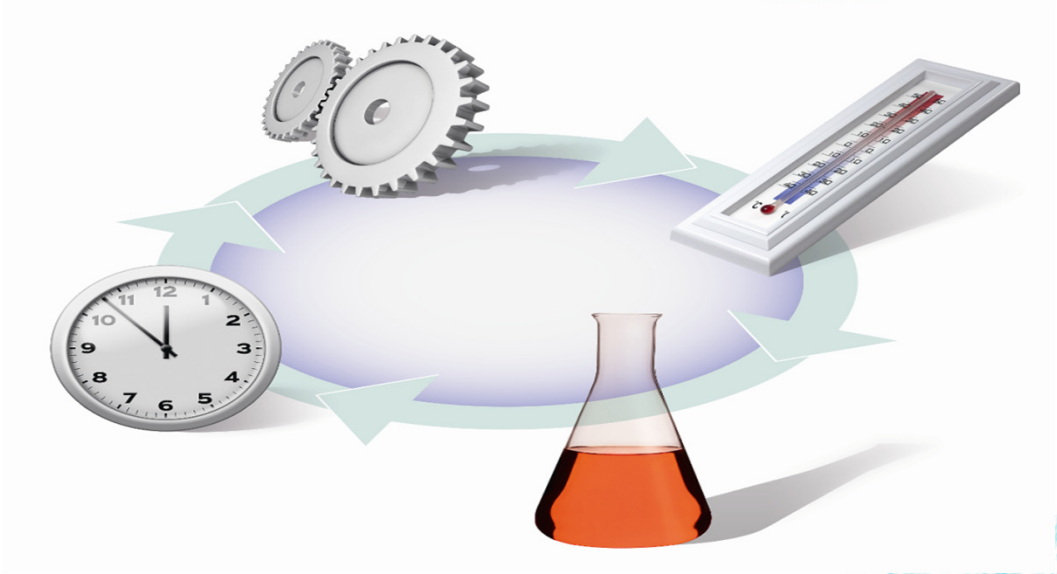
Law of mass cleaning action

The law of mass cleaning action expresses a relationship between **time**, **action**, **concentration**, and **temperature** in the process of removing soils. This laws states that if you decrease any one of these factors, we must increase one or more of the remaining factors in order to maintain equal cleaning ability



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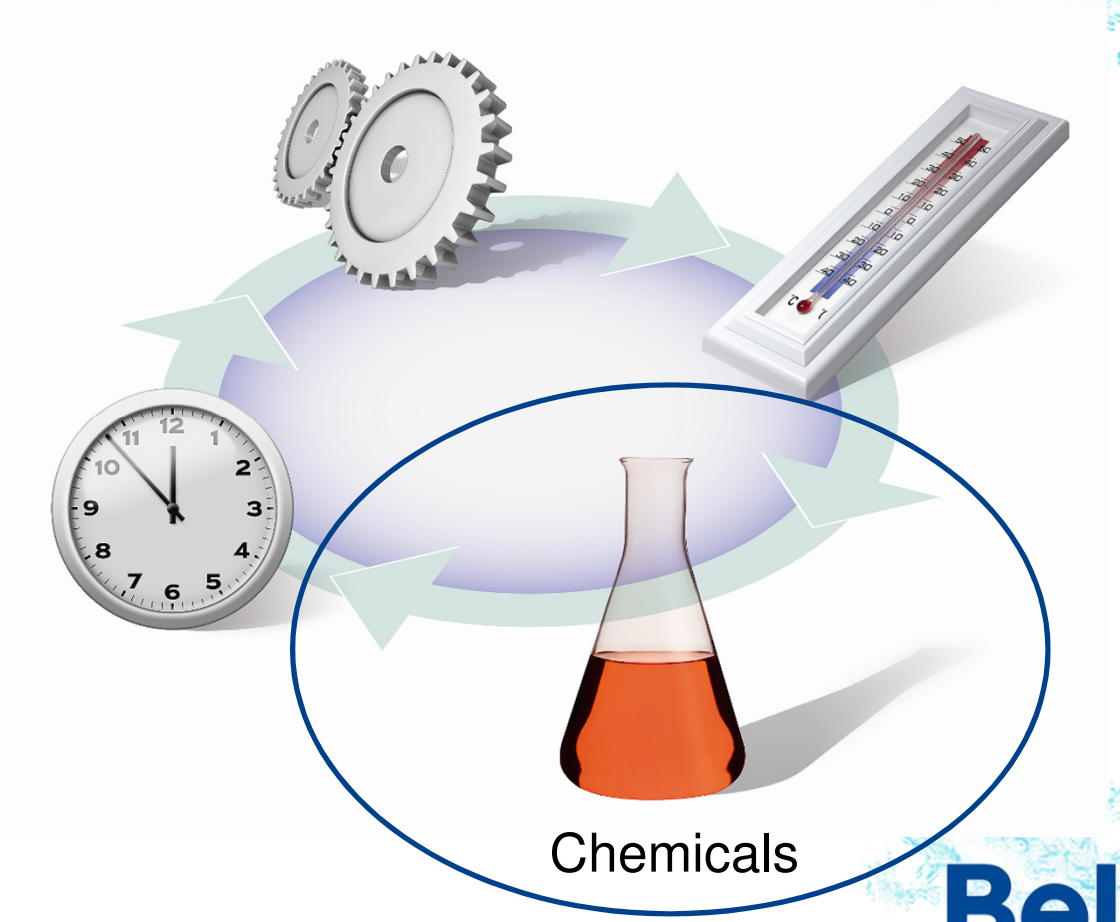
4 key factors for cleaning efficacy



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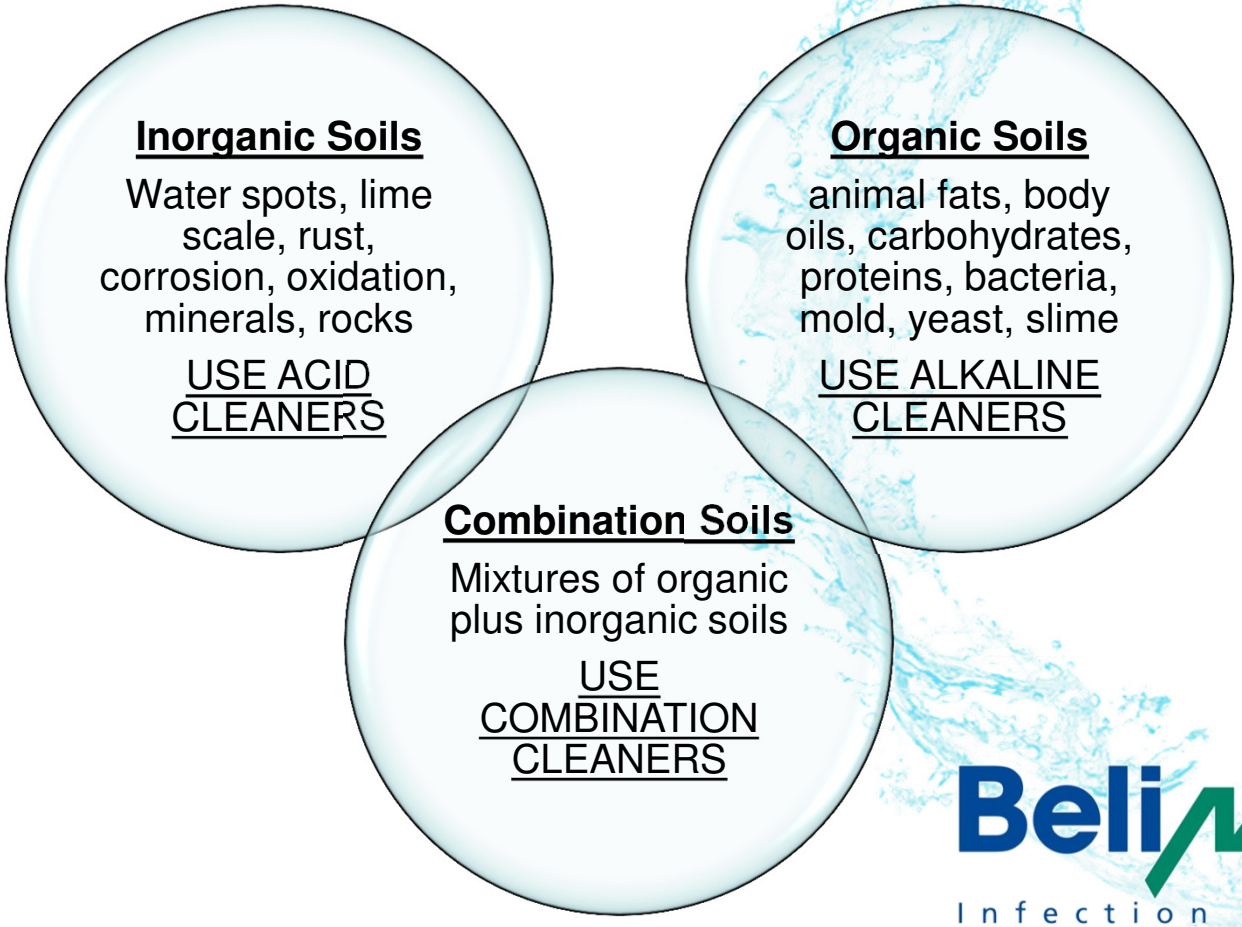
Chemistry - soil

- To properly clean something you need an understanding of the soil


Inorganic Soils
Water spots, lime scale, rust, corrosion, oxidation, minerals, rocks
USE ACID CLEANERS
Organic Soils
animal fats, body oils, carbohydrates, proteins, bacteria, mold, yeast, slime
USE ALKALINE CLEANERS
Combination Soils
Mixtures of organic plus inorganic soils
USE COMBINATION CLEANERS

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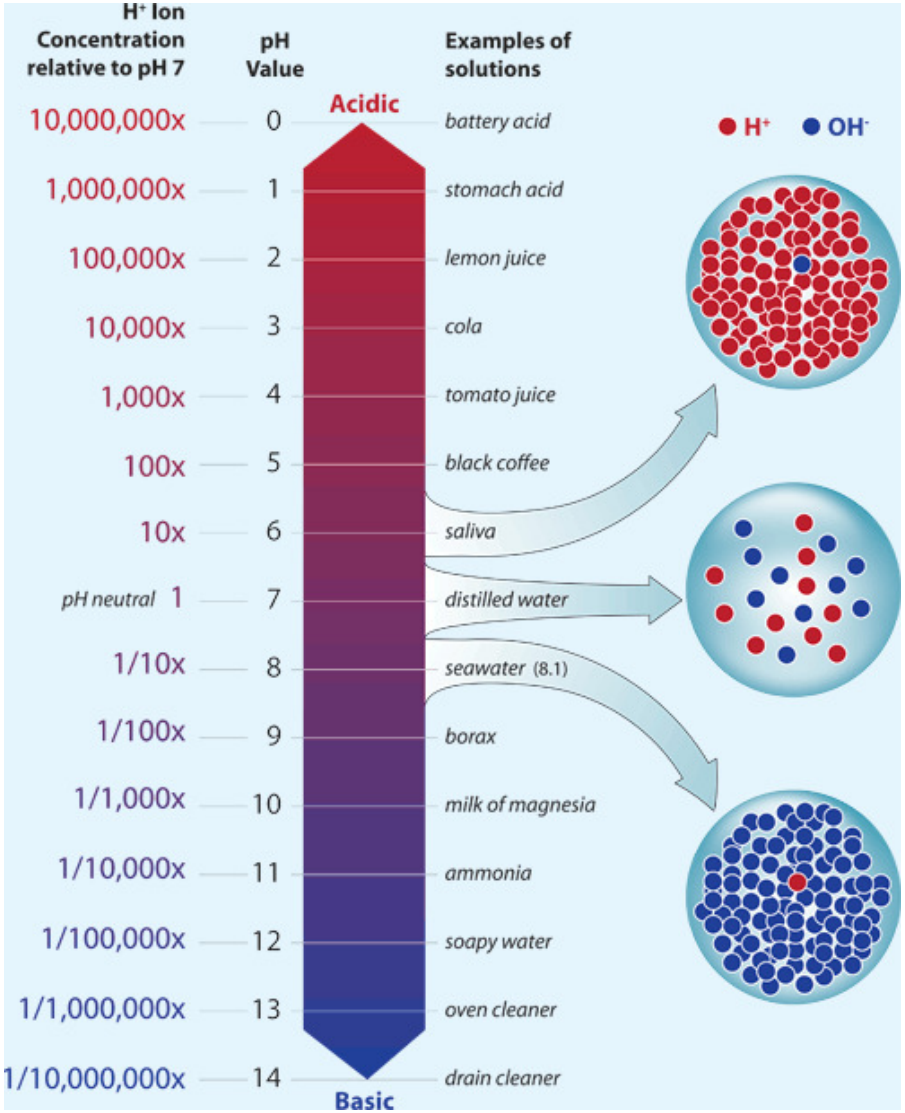
Chemistry - pH



- pH – This is a measure of the concentration of hydrogen ions (H+) in relation to the concentration of hydroxyl ions (OH-)

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Chemistry – cleaning power

- pH is a very important part of cleaning power.
- The reality is many hospitals choose to use pH neutral products. These products contain some of the following to perform the cleaning task:
  - Solvents
  - Surfactants
  - Enzymes
  - Chelating agents

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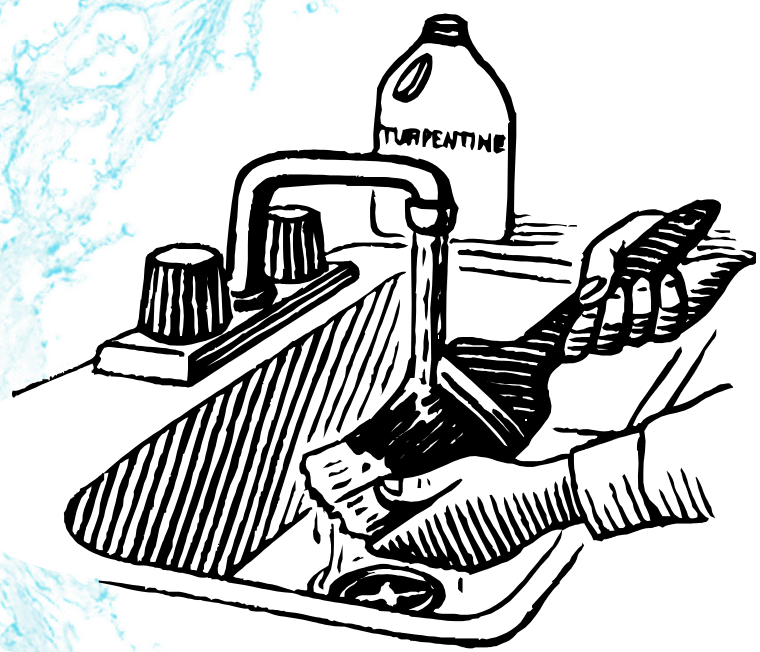
Chemistry - solvents

- **Solvent**
  - All cleaners require some sort of liquid solvent. This solvent not only "dissolves" the soil, but also provides a medium in which soil can be suspended and carried away from the surface.
  - Water is the oldest, least expensive and most widely used cleaning solvent known to man. In time, water will clean or remove just about every type of soil, be it organic, inorganic, petroleum or combination.



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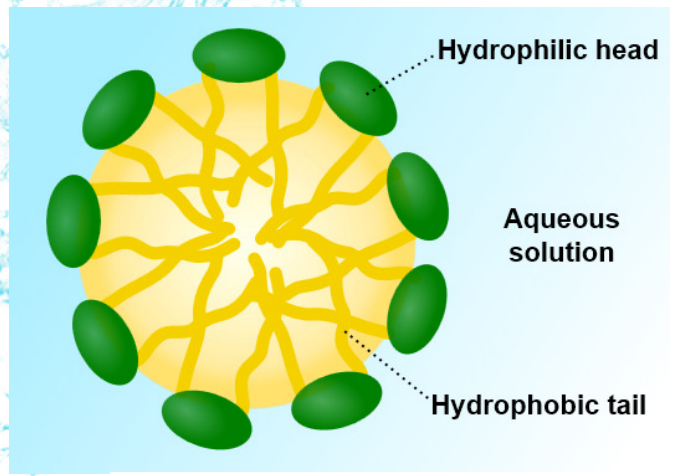
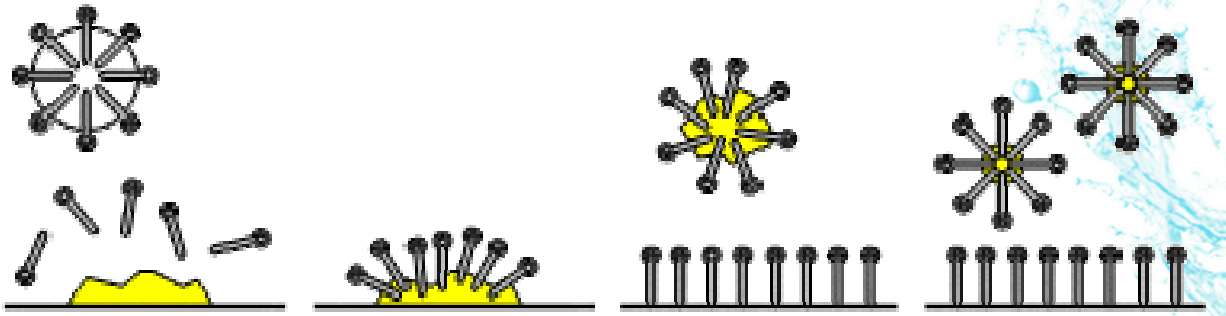
Chemistry - surfactants

Surfactant: sur·fac·tant

a.k.a - detergents or soaps

The word *surfactant* is short for "surface active agent". Surfactants work at the boundary layer (the *interface)* between the soil and the solvent. Each surfactant molecule has two chemical groups; one that is attracted to water (the *hydrophile)* and one that is attracted to soil (the *hydrophobe).*





http://en.wikipedia.org/wiki/Surfactant
http://en.wikipedia.org/wiki/Detergent

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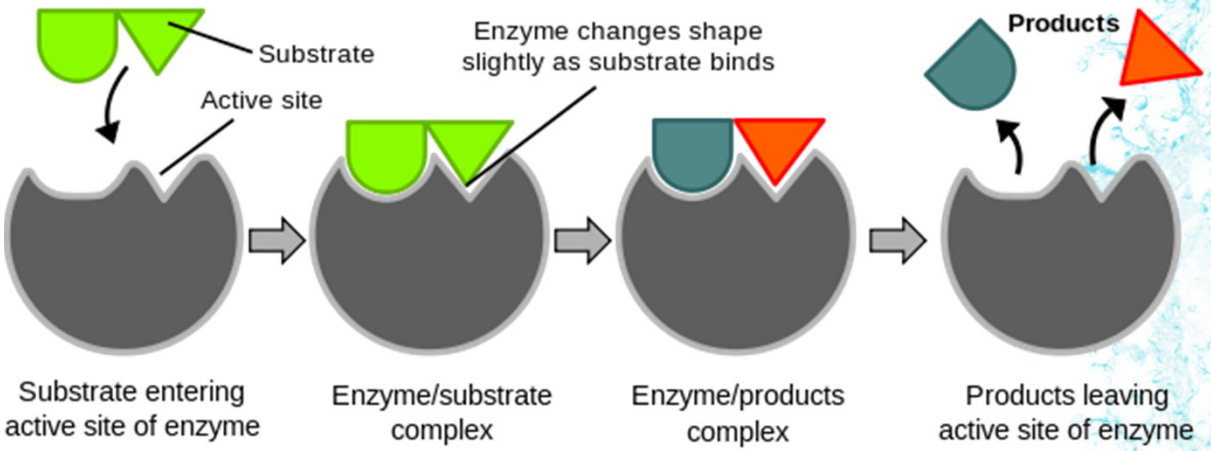
Chemistry – Enzymes



- **Protease (enzymes)**
  - Proteases can either break specific peptide bonds (*limited proteolysis*), depending on the amino acid sequence of a protein, or break down a complete peptide to amino acids (*unlimited proteolysis*). The activity can be a destructive change, abolishing a protein's function or digesting it to its principal components.

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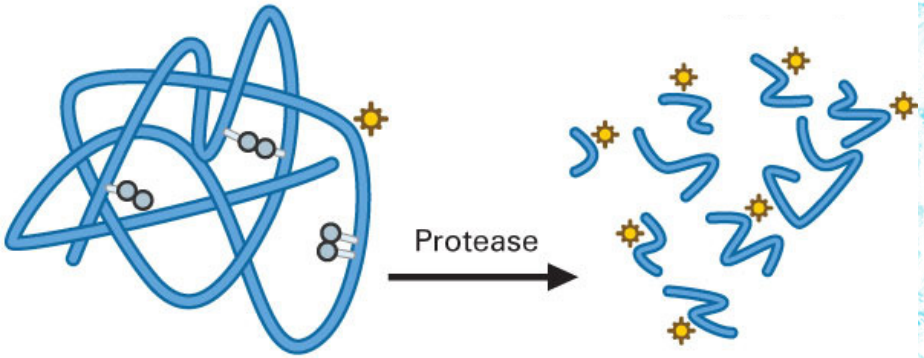
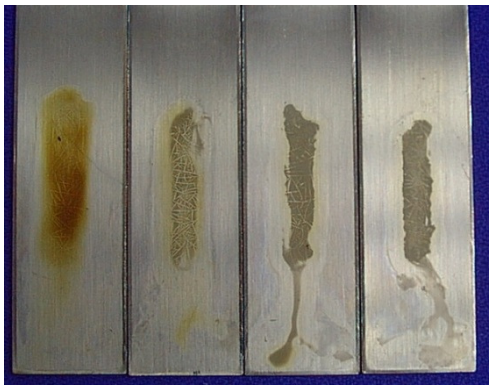
Chemistry - Enzymes

For example coagulated blood protein: fibrine-network is degraded to smaller parts that can be removed easlily





There are an endless number of different enzymes with different properties (different target molecules, pH, temperature, stability etc.)

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Chemistry- chelating agents

- **Chelating agents (che-lating)**
  - "tie up" the hardness in water. Dissolved minerals in water are the cause of hardness. Rain and distilled water is pure and soft, but it quickly dissolves minerals (mainly calcium, magnesium, iron and silica) as it soaks into the ground and travels through rivers or lakes. As the water becomes loaded with dissolved minerals, it becomes hard.
  - Hardness in water will hinder the cleaning ability of a cleaning solution. This is because the detergents and other active ingredients in the cleaner see the hardness minerals as "soil". These actives are used up by the hardness, and are not available to clean the soil we want them to.

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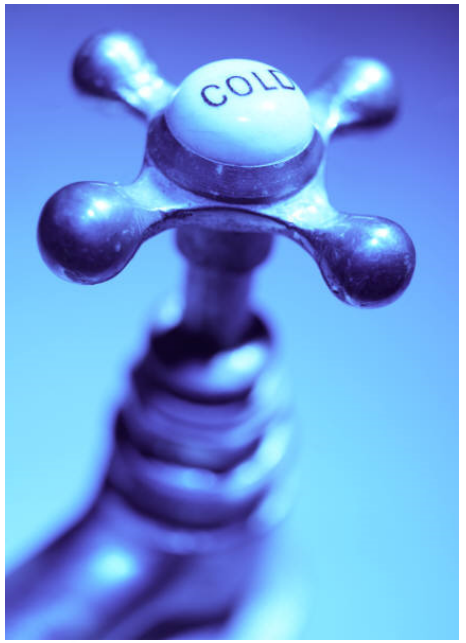
Basic wash program – pre-wash

Step 1 - Pre-wash ~ 2 min

- The maximum allowed temperature is 45C for all Pre-wash steps.
- Cold water will help prevent coagulation of blood onto the device.
  - If the water temperature increases to above 45C error code 163 “Water too warm” will be flashed and the process is interrupted.
- Since ~ 2009
  - S109 repeat option is available.
    In the event that excessive foam is detected in the unit during prewash, the unit will halt the process drain the washer and begin again.



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Basic wash program - wash

Step 2 - Wash ~ 5 min

- Warm Water is mixed with the cleaning agent or detergent.
  - If the water temperature increases by more than 8C error code 163 “Water too warm” will be flashed and the process is interrupted. You can set temperature to 0C to prevent error code.
- If there is excessive foaming in the load the unit will abort. Foam inhibits the units ability to clean instrumentation – Action from the law of mass cleaning

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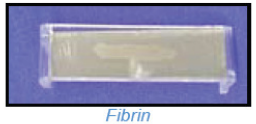
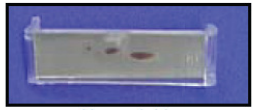
TOSI testing

Reveal the Hidden Areas of Surgical Instruments with the TOSI™

WT-101

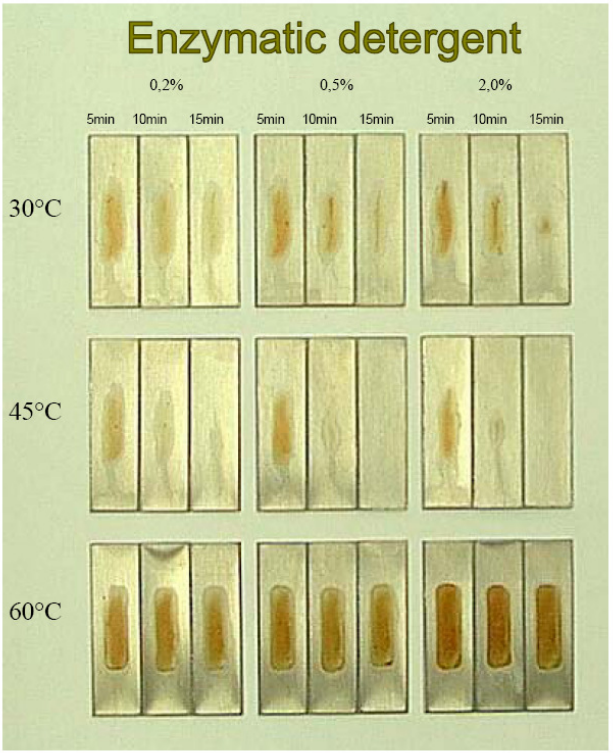
Before


Fibrin


Hemoglobin

Pass

Reveal the hidden areas of instruments (like box locks) with the TOSI™ automated washer test, the easy to use blood soil device that mimics the cleaning challenge of surgical instruments. TOSI™ (Test Object Surgical Instrument) is the first device to provide a consistent, repeatable, reliable method for evaluating the cleaning effectiveness of the automated instrument washer. This is possible, because the test soil is manufactured to exacting specifications each and every time. When coated on to the stainless steel plate, the TOSI™ mimics the dried blood residue found on dirty instruments. Placed in the see-through plastic holder, with a graduated gap, the challenge is identical to the areas of instruments typically hidden from view (e.g., box locks). Sterile is not sterile, if clean is not clean. Until now there has not been a device that consistently, and independently provides an objective test of clean. We have had to rely solely upon random visual inspection of the actual instruments. TOSI™ changes that - the routine use of this test will insure that the Washer is performing at a consistent level, enhancing the routine visual inspection of instruments. TOSI complies with ASTM Guide D7225.



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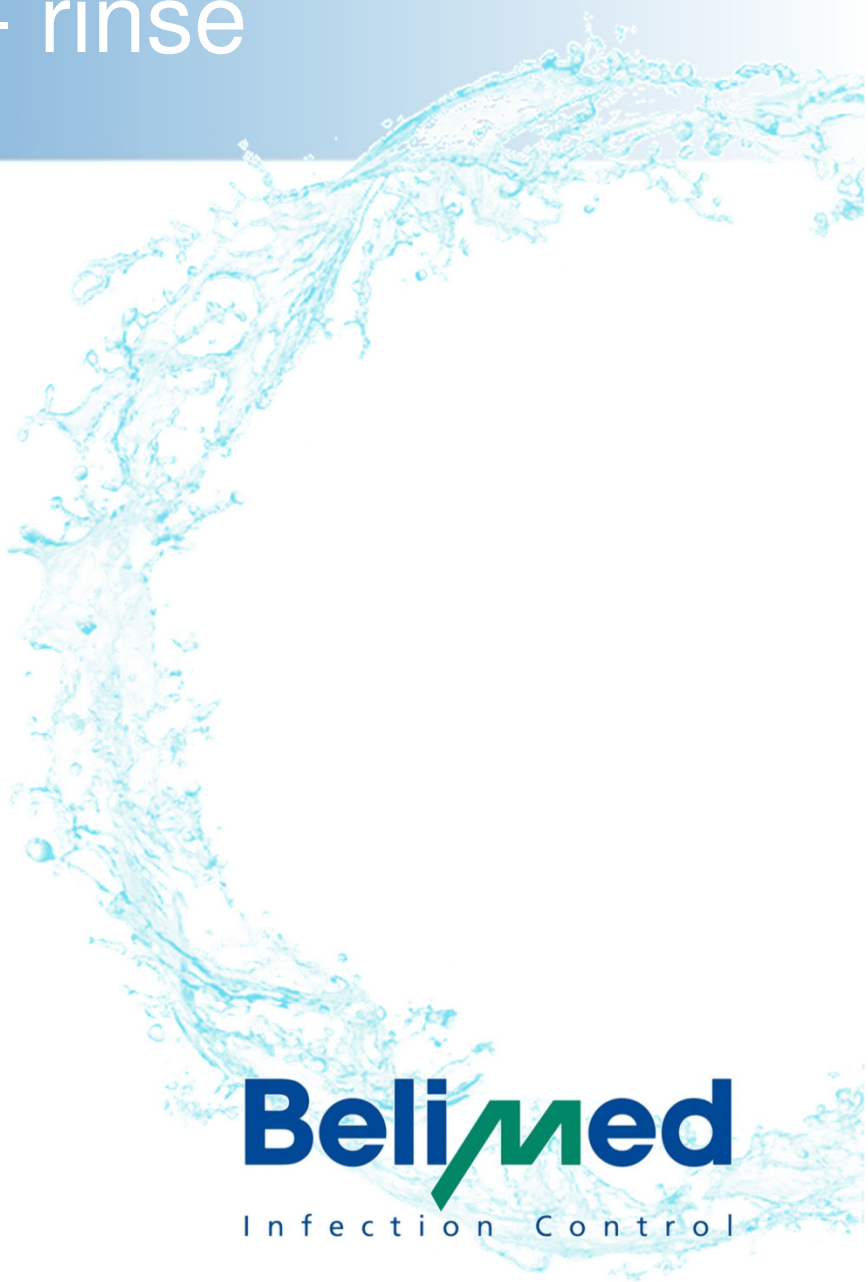
Basic wash program - rinse

Step 3 - Rinse ~ 1 min

- Warm Water is used to rinse off the cleaning agent or detergent.
- The length and number of rinse repeat steps will be determined by the detergent products rinse ability.



Basic wash program – clean rinse

Step 4 - Clean Rinse ~ 1 min

- DI/RO is used with instrument lubricant added (optional)
  - Only in models since ~2009, pre-2009 add lubricant directly to the thermal disinfect step
- AAMI 7.5.4 *"the final rinse should be performed with treated water that is of a quality that does not contribute to staining or contamination of the instrument."*

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Basic wash program – thermal disinfect

Step 5 – Thermal Disinfect A_0=3000 ~ 10 min

- DI/RO helps maintain instrument luster
- The Robert Koch institute in Germany states, “all medical products should be disinfected to an A_0 = 3000”
- A_0 = 3000 has been proven effective against heat resistant viruses such as Hepatitis-B

$$A_0 = \Sigma \left(10^{(T-80)/Z} \right) \Delta t \longrightarrow (Z=10, \Delta t=10 \text{ Sec above } 65^\circ C)$$

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Basic wash program – dry

Step 6 - Dry ~ 8 min

- Temperature setting of 130C is recommended.
- Dry instruments reduce the chance of wet-packs from the sterilizers.
- Some instruments are more difficult to dry than others. We recommend that careful analysis be done to determine if minor hand drying of plastic instruments might be a better option over lengthening the drying time. Subjecting plastics to high temperatures for a prolonged period can be detrimental to the plastics.

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Cycle times

- **Effective cycle times. No shortcuts.**

Cycle Step	Belimed 31 min cycle
Pre-wash	2 minutes
Wash	5 minutes
Rinse	1 minute
Clean Rinse	1 minute
Thermal Rinse	2.5 minutes
Dry	8 minutes
Total Active time (sum of above five step times)	19.5 minutes
Cycle Time	~31 minutes
Other time (Cycle time -Total Active time)	~11.5 minutes

- The full cycle simply and consistently ensures active/effective steps like wash and dry

Belimed Infection Control

Washing concepts

- Single wash pump
  - Optimizing the water level is significantly simpler using a single pump.
- Wash Principles
  - By using a **high volume of water under low pressure** we allow the water/detergent mixture sufficient contact time to perform the cleaning task.
- Dynamic washing
  - The controller admits only as much water as is needed for proper operation of the circulation pump, an adequate additional quantity of water is subsequently introduced.

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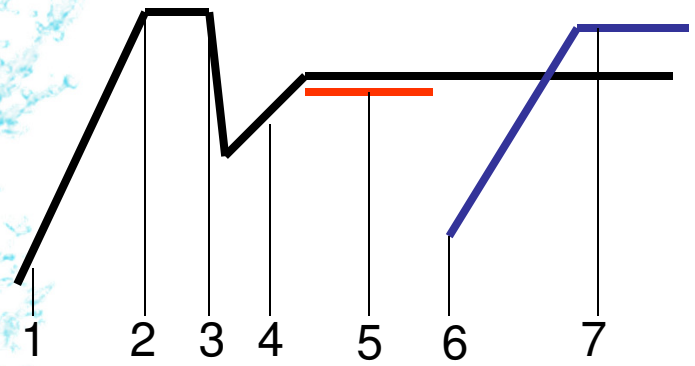
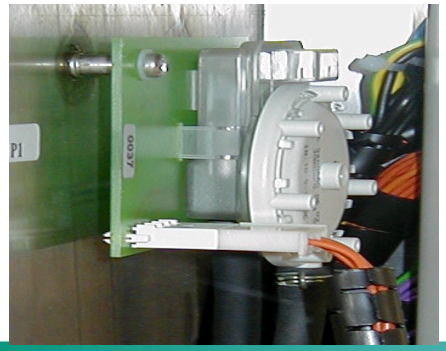
Dynamic fill

1. Water fill
2. Initial fill level set point 2.1V
3. Pump switches on
4. Additional fill to operating level 1.7V
5. Chemical dosage is calculated and added
6. Heater is turning on
7. Operating temperature is reached
   - ➢ The set time begins to countdown





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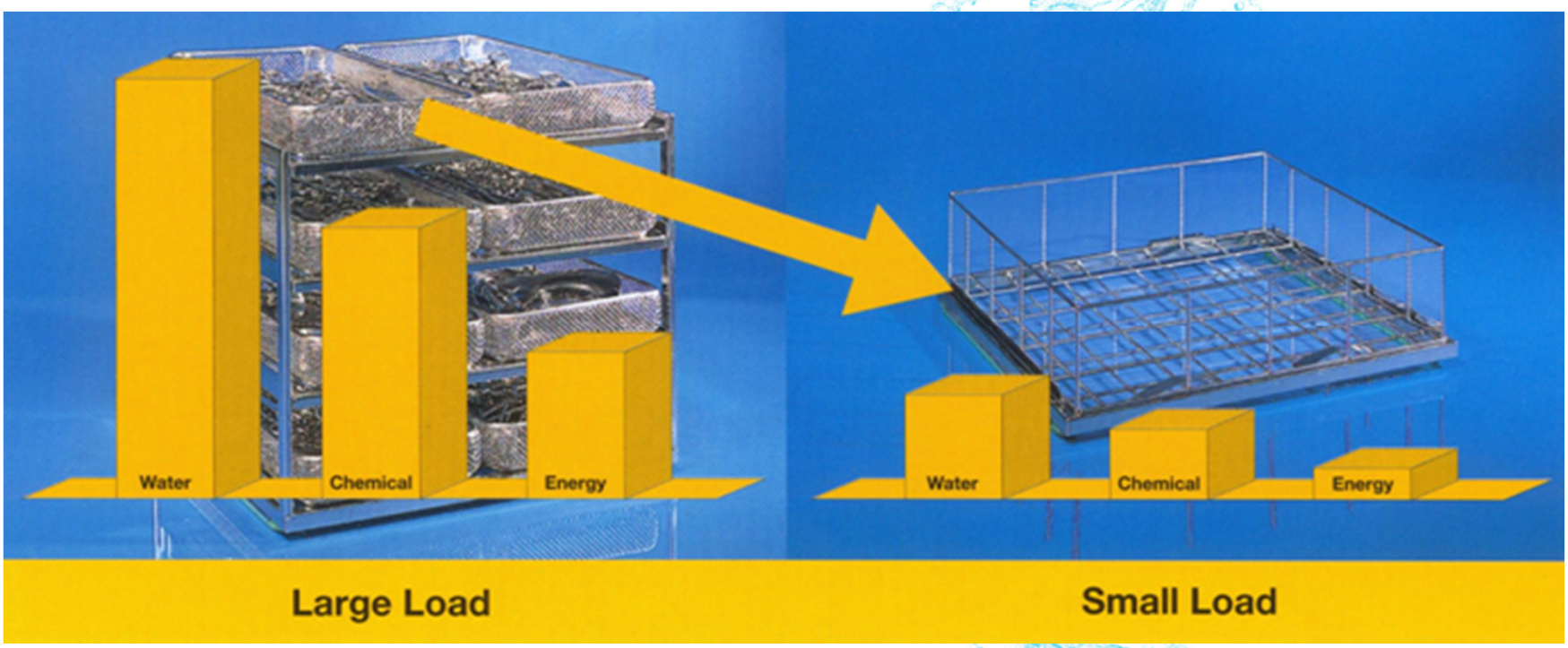
Dynamic fill advantages



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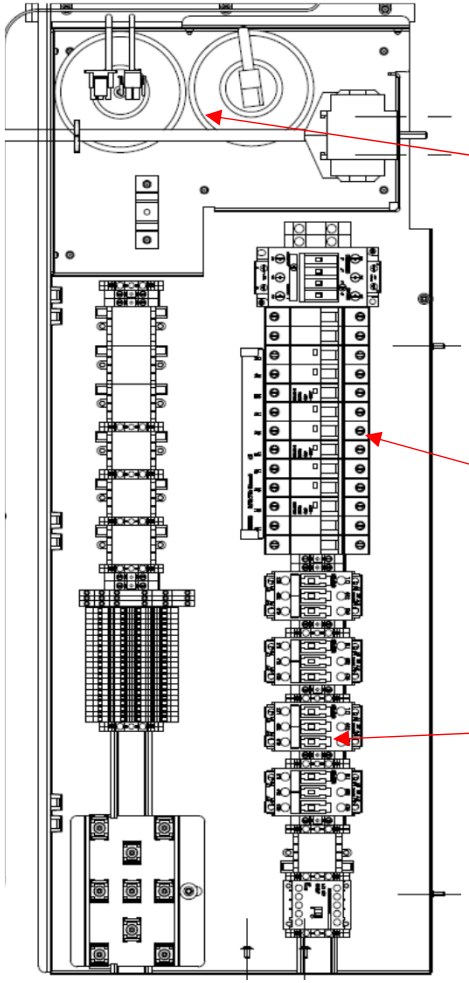
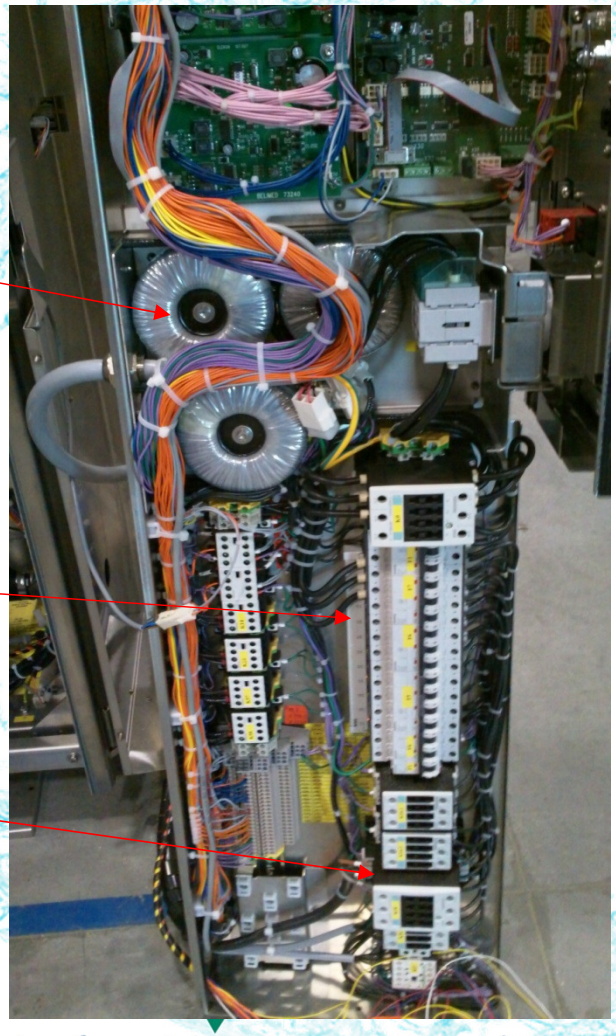
WD-290 high voltage section



Power Supply

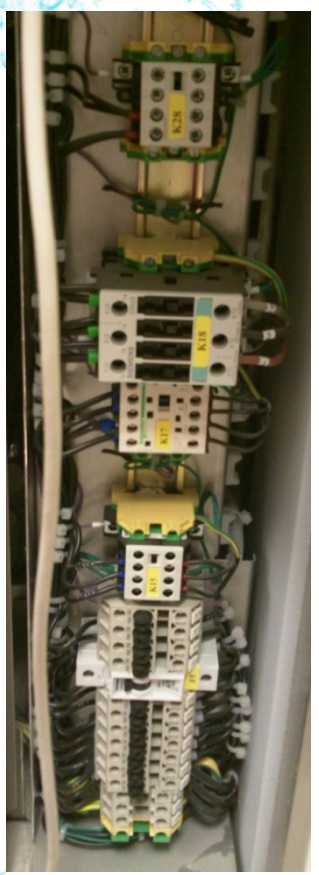
Circuit breakers

Contactors



Electrical/mechanical components

- Contactors/relays
  - K15: circulation pump
  - K17: blowers
  - K18: heaters
  - K28: auxiliary output
  - K32: chamber light
  - K33: automation drive
  - K35: DS door open
  - K36: DS door close
  - K37: CS door open
  - K38: CS door close
- Motors
  - M15: circulation pump
  - M17: blowers
  - M41: DS linear motor
  - M42: CS linear motor



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Electrical components and controls

- Sensors/Switches
  - Level sensor P1: monitors water level in sump
  - Water temperature sensors NTC1/NTC5: monitor sump temperature of water
  - Air temperature sensor NTC2: monitors air temperature
  - Door switches, upper S1/S2 (input S110/S111), lower S112/S113
  - Circulation pressure S211: ensures adequate water quantity
  - Air pressure P18: ensures adequate air flow
  - Differential pressure S109: checks for clogged screens
  - Rack sensors S101,102,103,106,107: automatic program recognition
  - Rack sensor S105: rack in position
  - Water Level Overflow Safety Switch S31

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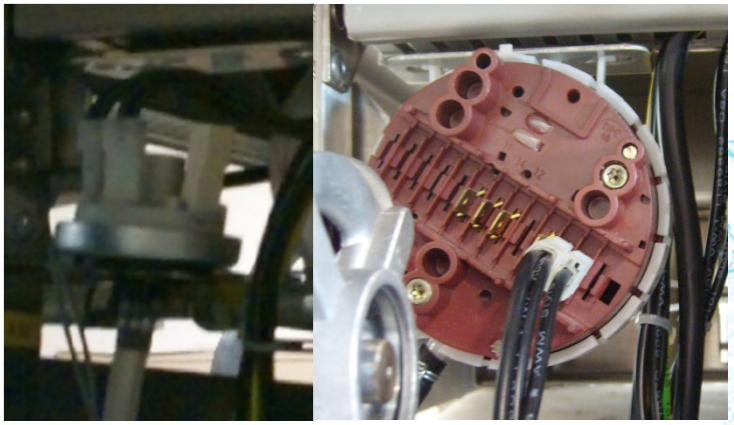
Electrical/mechanical components

P1 Level sensor

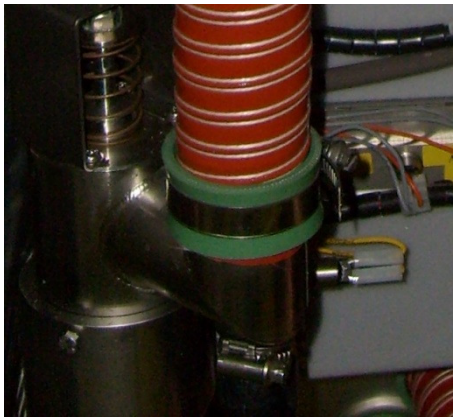
S31 Safety level switch



NTC1/NTC5 Tank Temp sensor

S109 Diff Pressure Switch

NTC2 Air Temp sensor



S211 Circulation pressure switch

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Infection Control

Door latch mechanism for WD-230

When handle is turned the claw meets a mechanical switch.

The door can be unlocked manually my pulling on the white strings.

Slamming the lock can damage the mechanical switch.

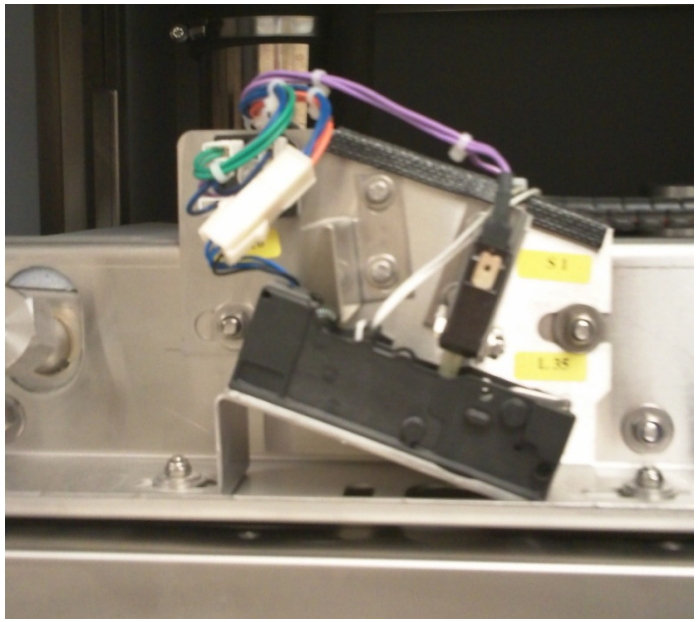

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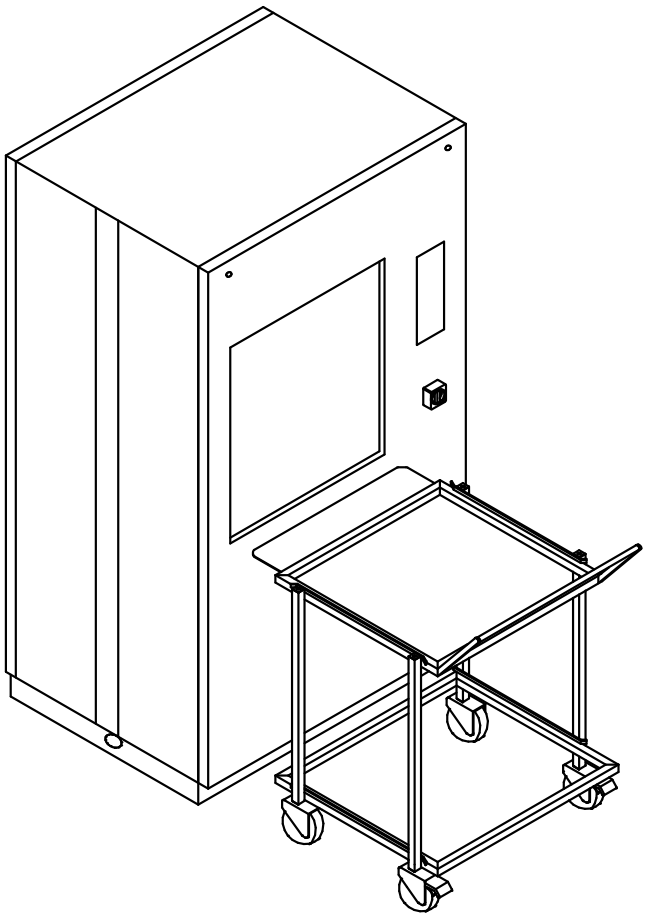
Diagram WD 250 USA

820821, 99826, 3P 208V, 60Hz Stem /Electric



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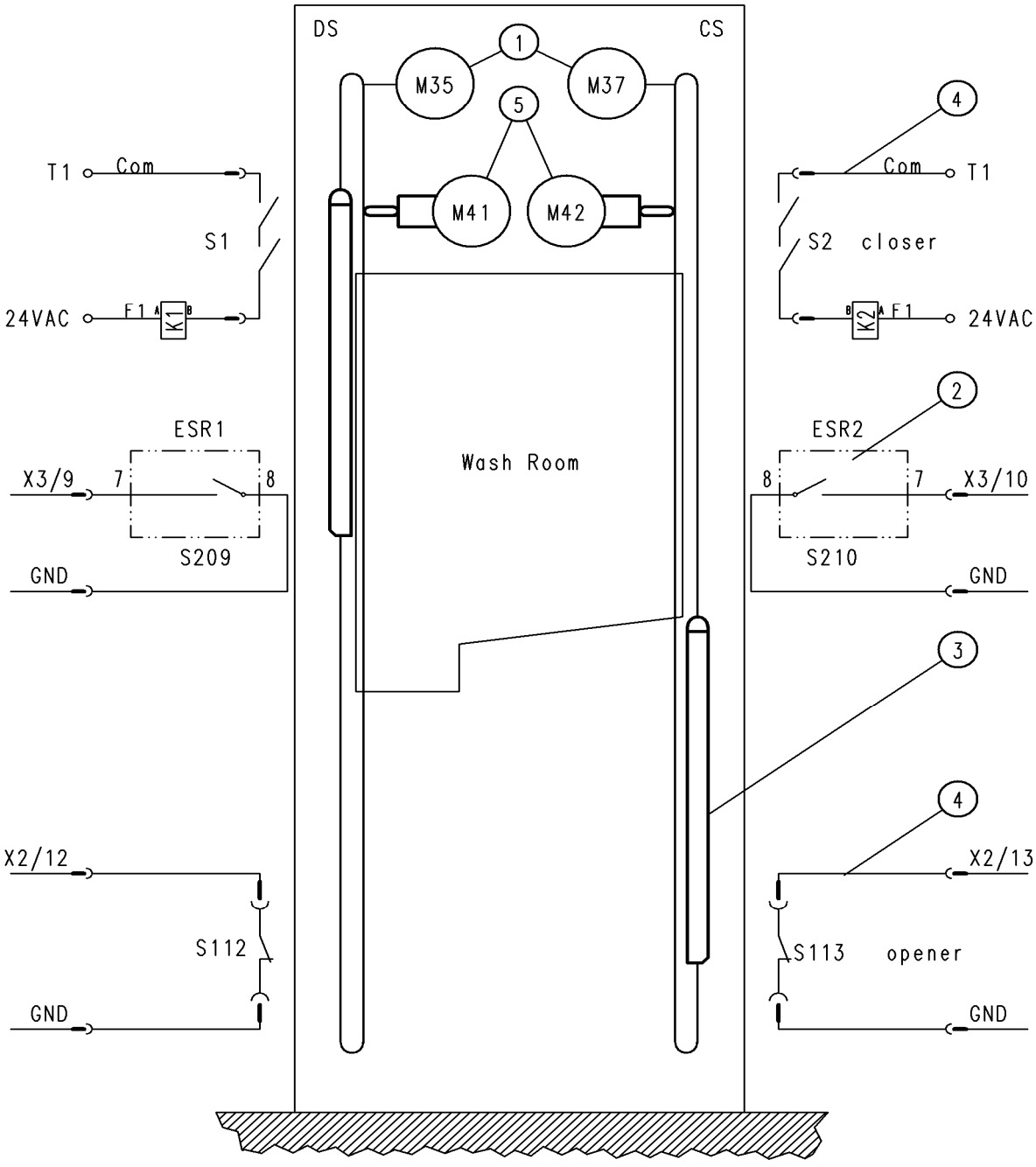
Function Diagram Door Automatic

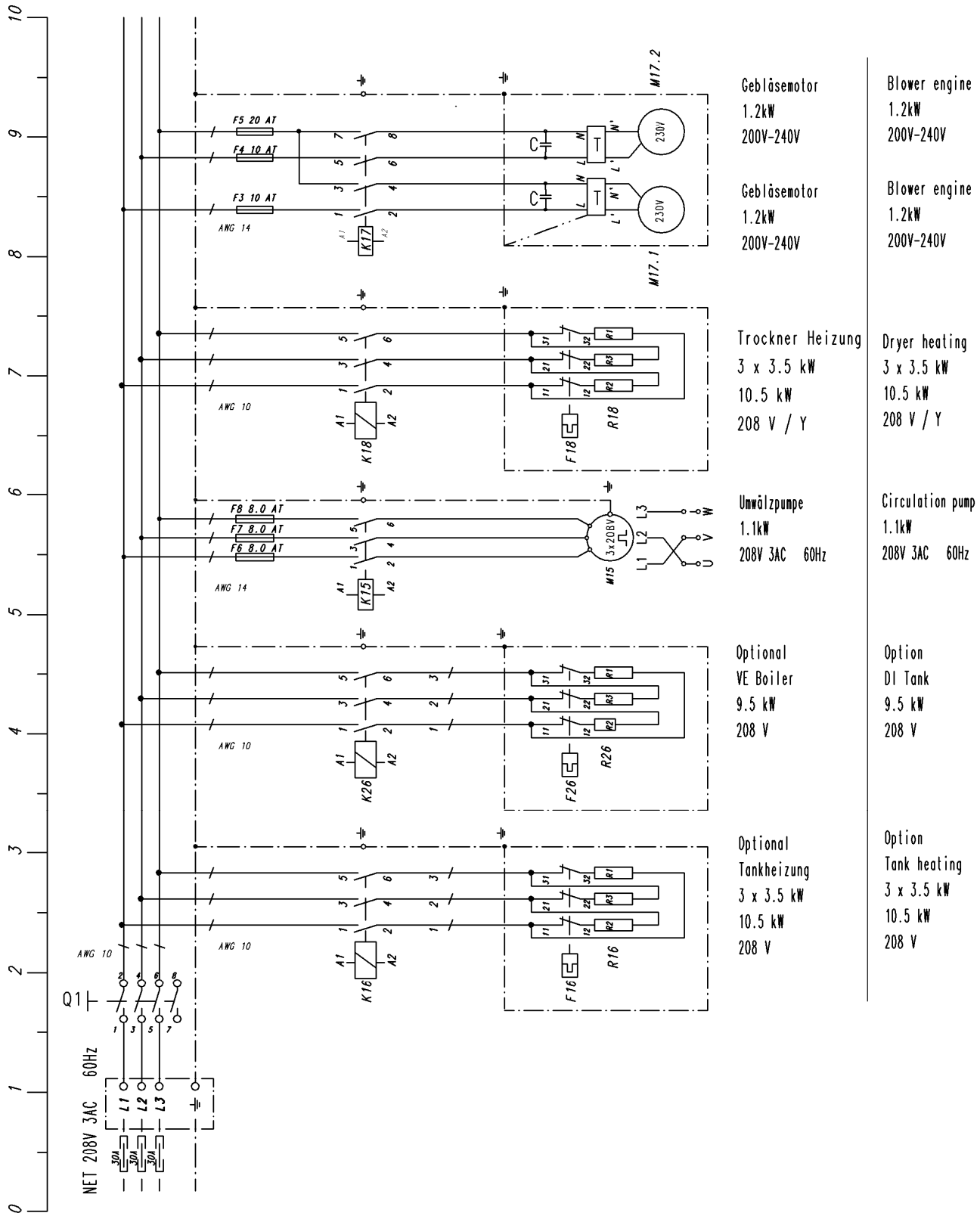
ab Maschinen-Nr.:
machine number :



1	Türmotor	1	Door drive motor
2	Sicherheitsabschaltung	2	Safety disconnection
3	Türe	3	Door
4	Readschalter	4	Read-switch
5	Linearantrieb	5	Drive motor

machine number : ab Maschinen-Nr.: 998260031001

Circuit Diagram 208V / 60Hz



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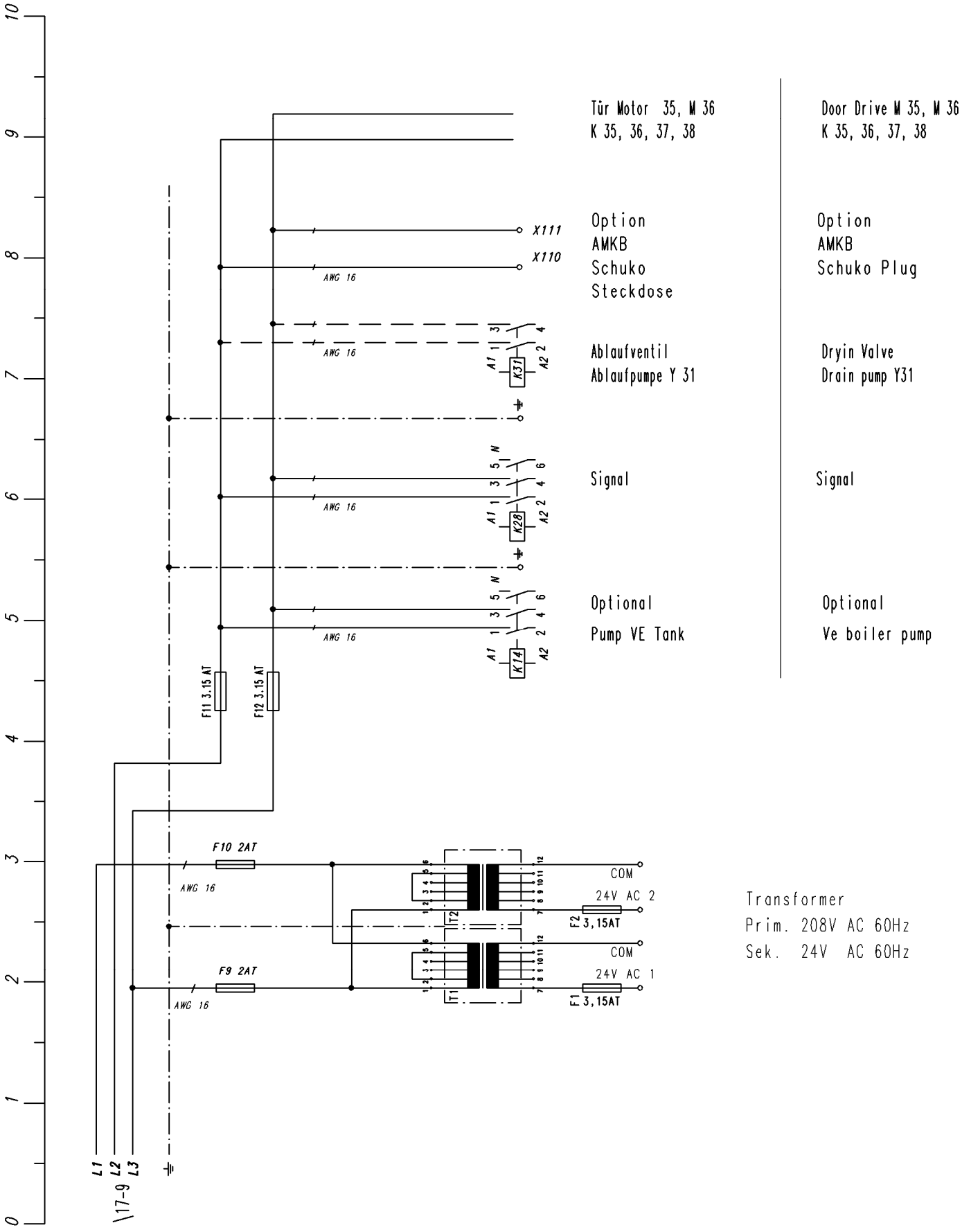
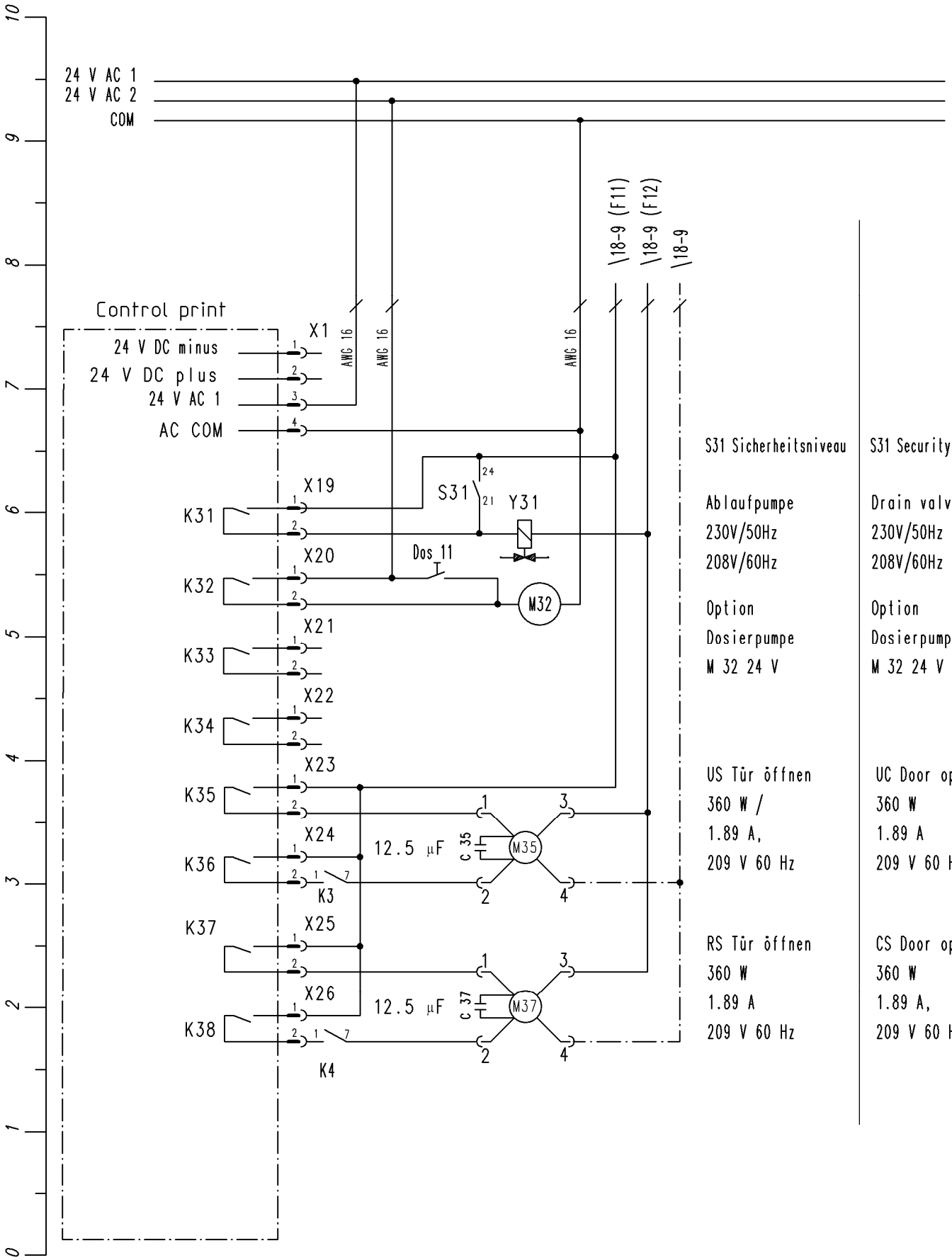
Circuit Diagram 208 V / 60Hz

machine number : | ab Maschinen-Nr.:



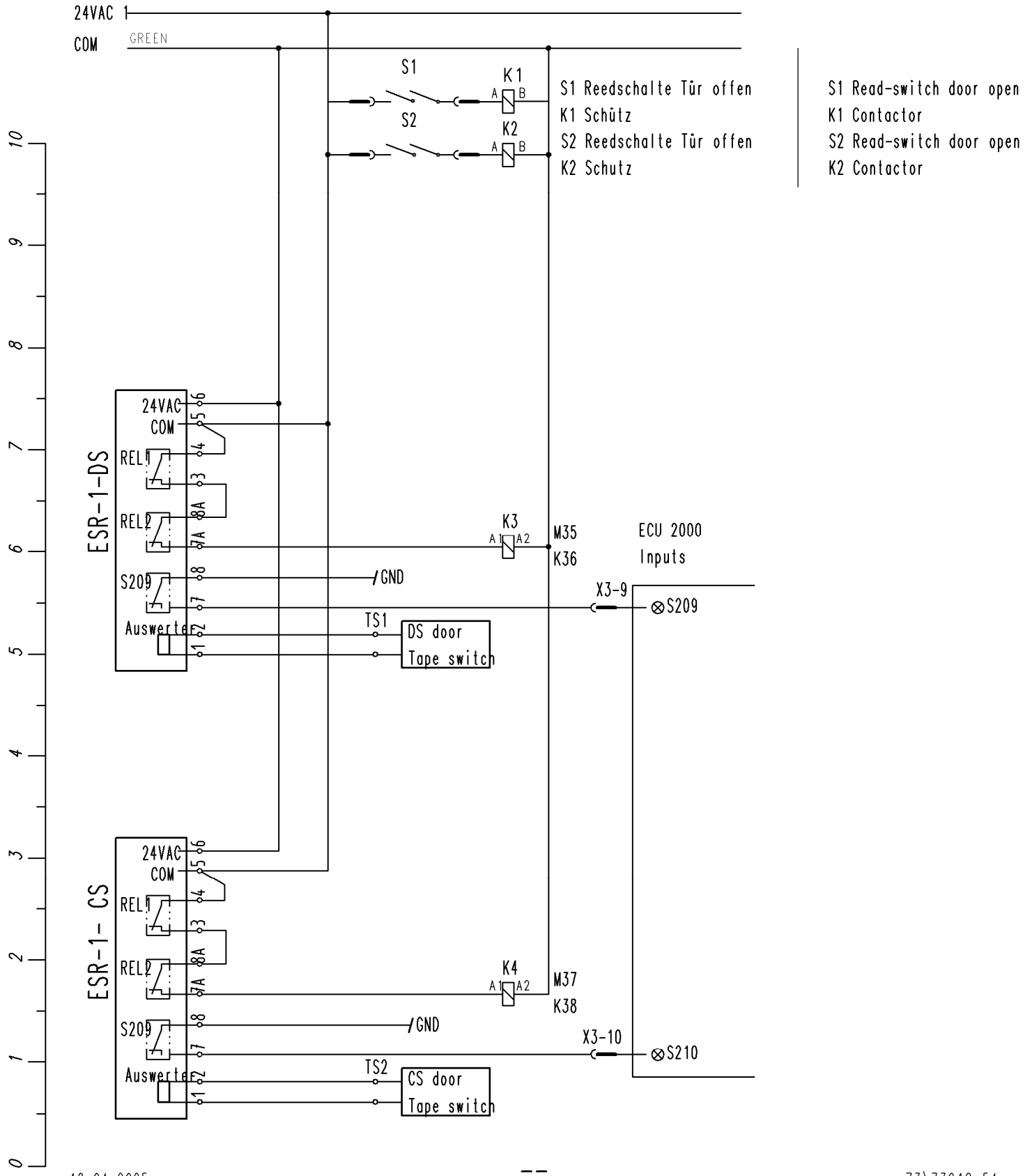
Electric Circuit Output Relais K31 - 38 208V/60Hz

ab Maschinen-Nr.: 998260021001
machine number :



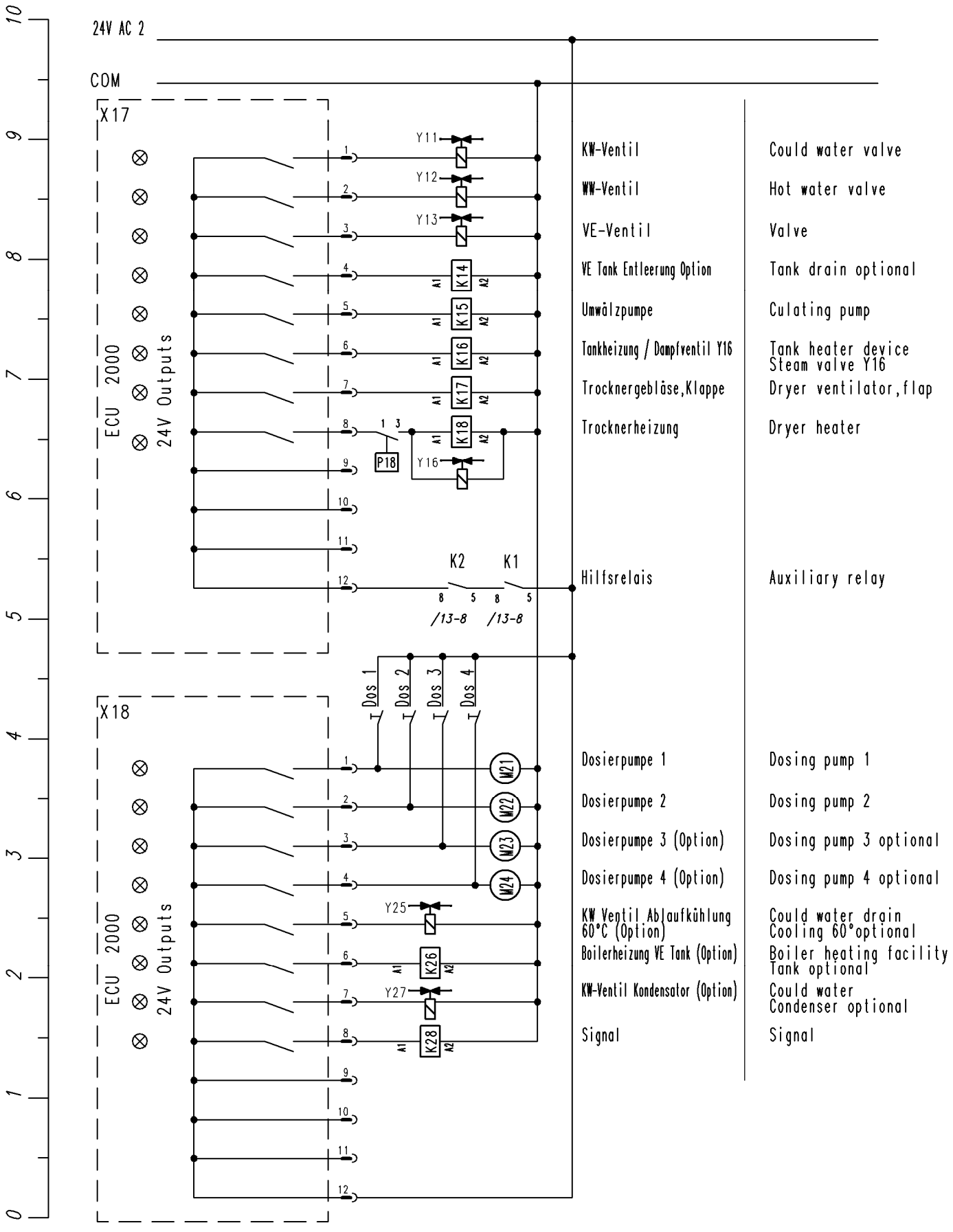
ab Maschinen-Nr.: 998250021001
998260021001
998270021001
998280021001

Door Savety System WD 250/290 50/60 Hz



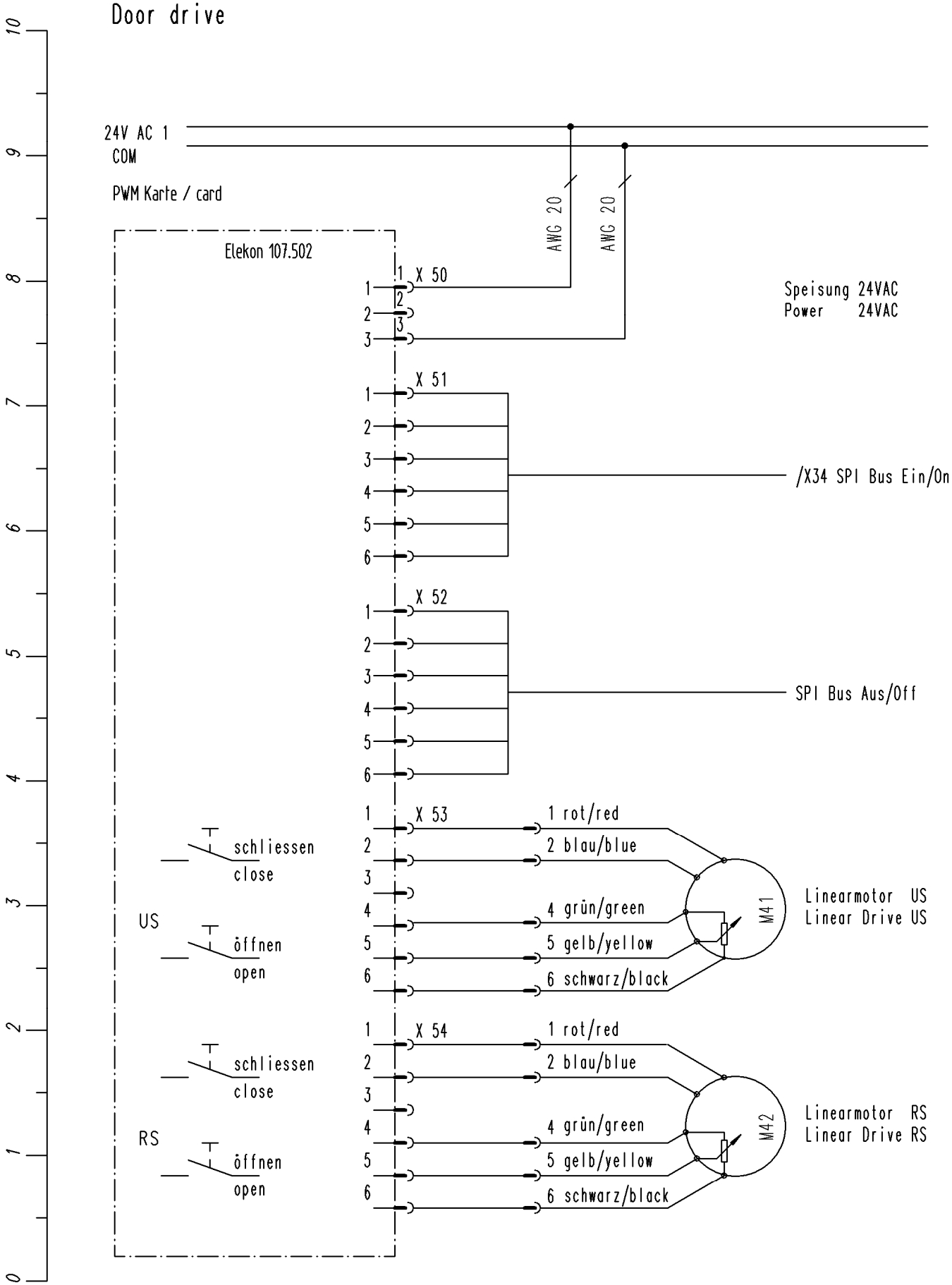
Digital Output 24V

machine number : | ab Maschinen-Nr.:

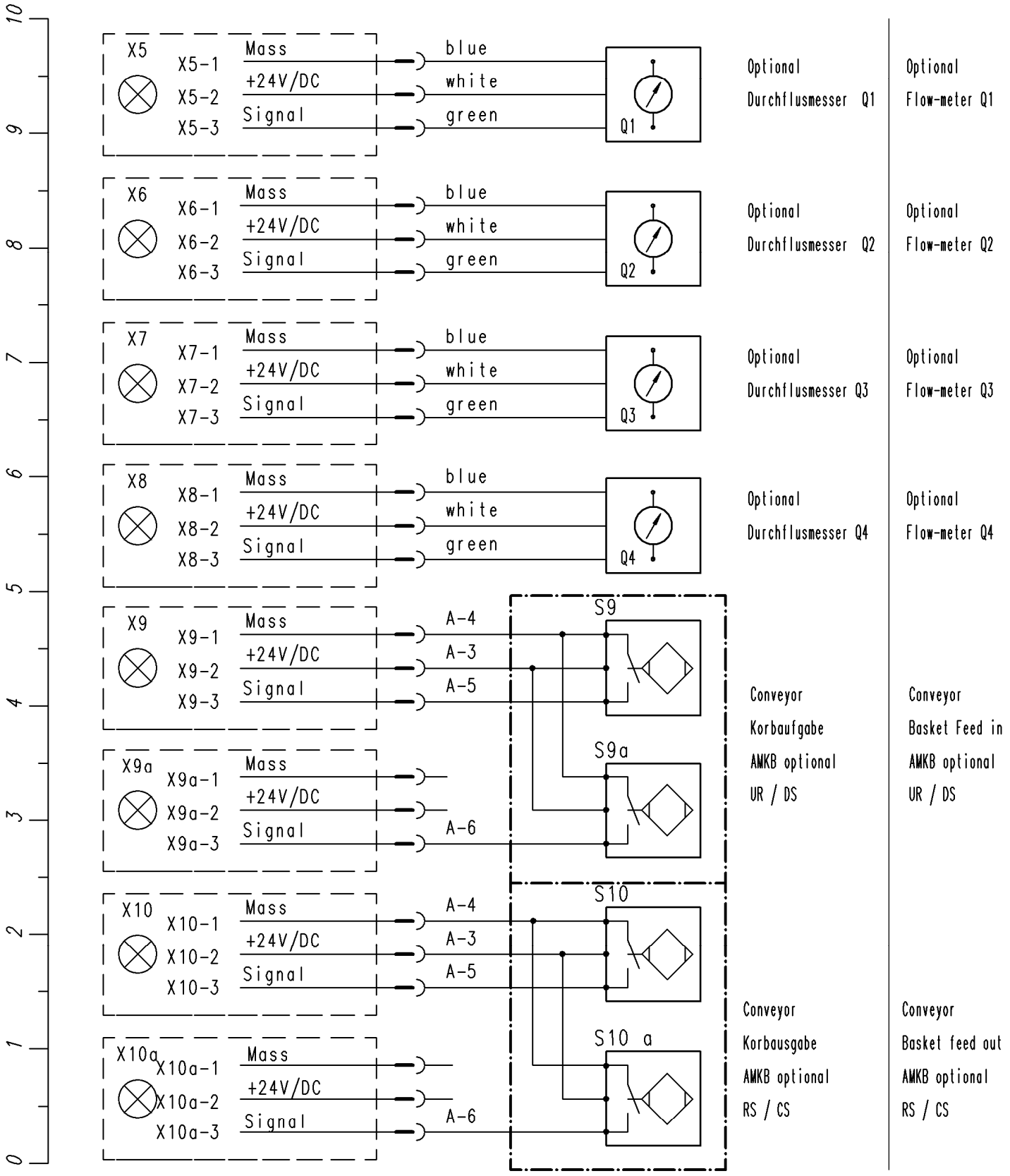


ab Maschinen-Nr.:

Türanpressung
Door drive

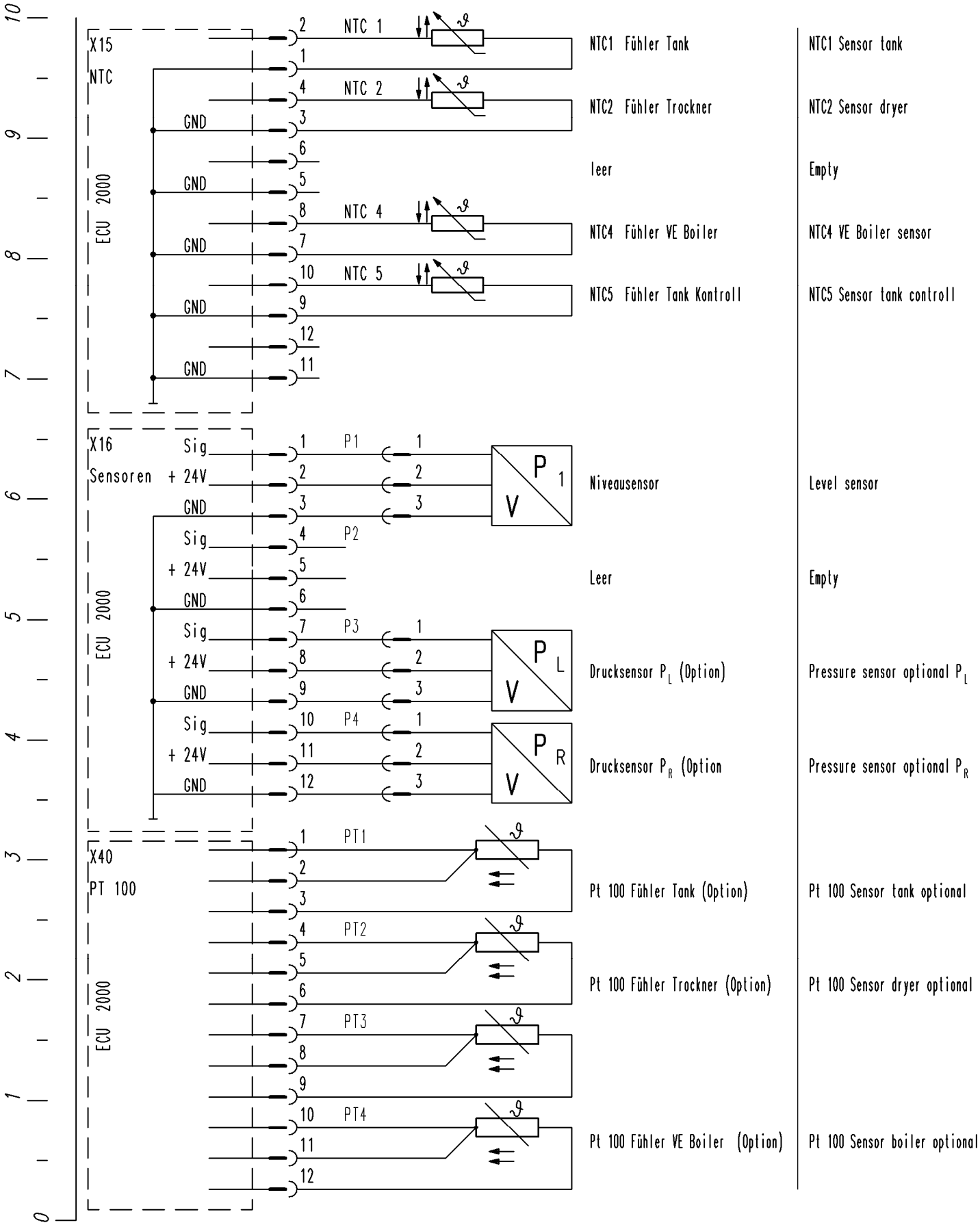


Analog Inputs

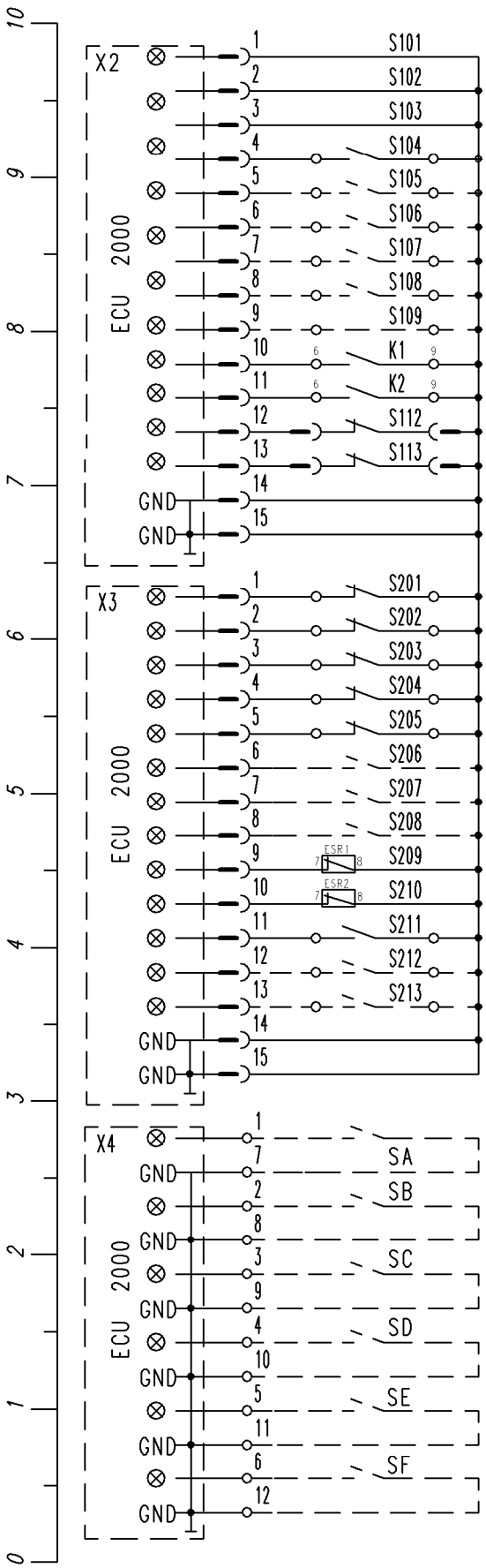


Analog Inputs

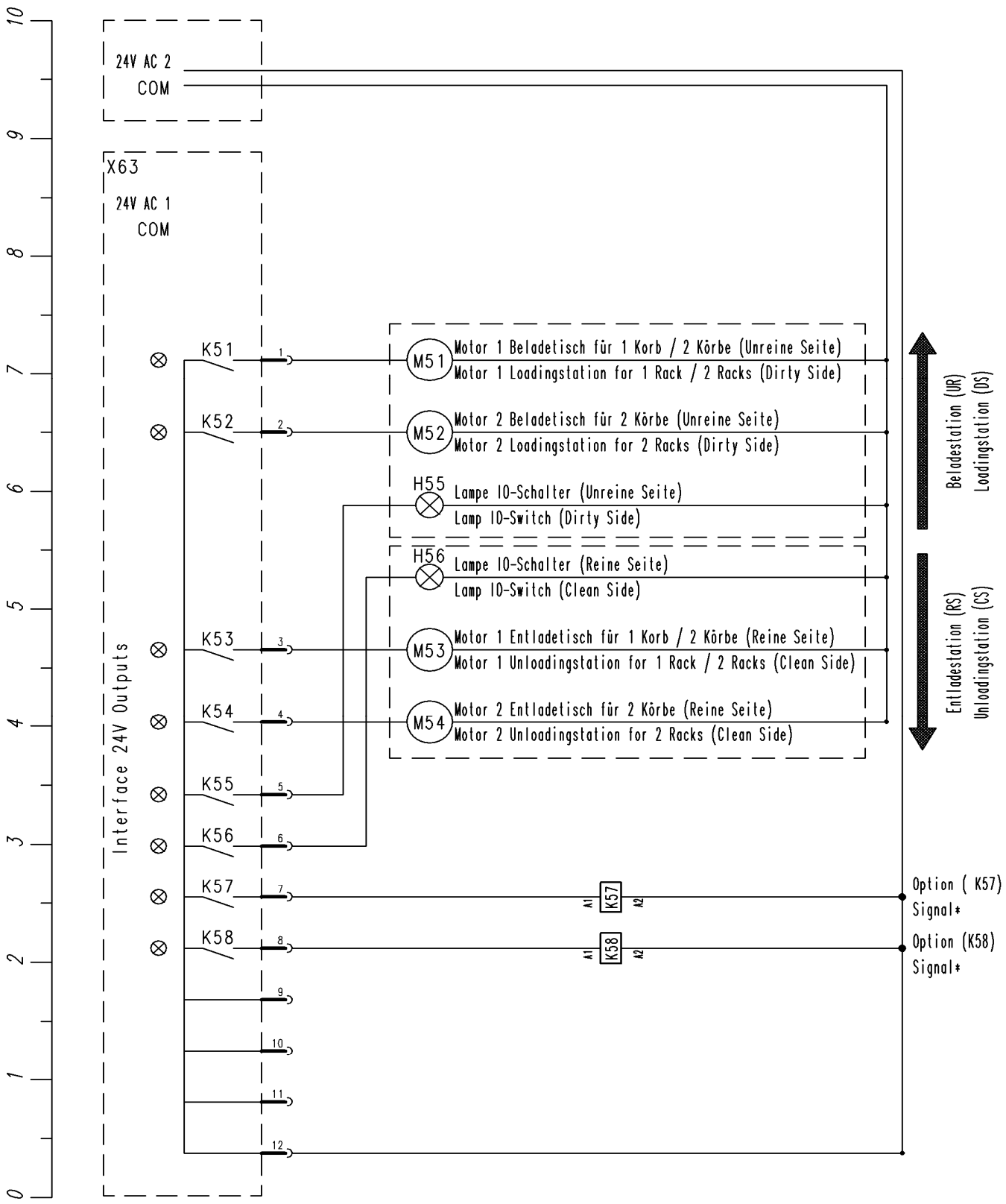
machine number : | ab Maschinen-Nr.:



Digital Inputs



Machine code 250	Machine code 250
Machine code 250	Machine code 250
Machine code 250	Machine code 250
Reset/door close optional	Reset / RS Tür schliessen Option AMKB
Rack position optional	Korbpositionierung (Option)
Rack coding facility optional	Korbcodierung (Option)
Rack coding facility optional	Korbcodierung (Option)
Rack coding facility optional	Korbcodierung (Option)
Flap motor optional	Motorische Klappe (Option)
Auxiliary relay door above	Hilfsrelais Türe US oben
Auxiliary relay door above	Hilfsrelais Türe RS oben
Door switch down	Türschalter US zu
Door switch down	Türschalter RS zu
Empty fluid level display 1	Leerstandsanzeige 1
Empty fluid level display 2	Leerstandsanzeige 2
Empty fluid level display 3	Leerstandsanzeige 3
Empty fluid level display 4	Leerstandsanzeige 4
Empty fluid level display 5	Leerstandsanzeige 5
AMKB	AMKB
FAC Conveyor manuell	FAC Conveyor Manuell
FAC Conveyor automatic	FAC Conveyor Automatisch
Tape Switch US	Tape Switch US
Tape Switch RS	Tape Switch RS
Pressure switch	Druckschalter 50 mbar
Differential pressure filter optional	Differenzdruck Filter (Option)
Disturbance exhaust air system	Störung Abluftanlage (Extern)
Burden switching off extern optional	Lastabschaltung (extern Option)
Leaking-display drip tray optional	Leckanzeige Bodenwanne (Option)
VE Boiler code optional	VE Boiler Code (Option)
Float switch VE boiler optional	Schwimmerschalter VE Boiler (Option)
Door UR open conveyor	Conveyor (Option)
Door RS close conveyor	Conveyor (Option)

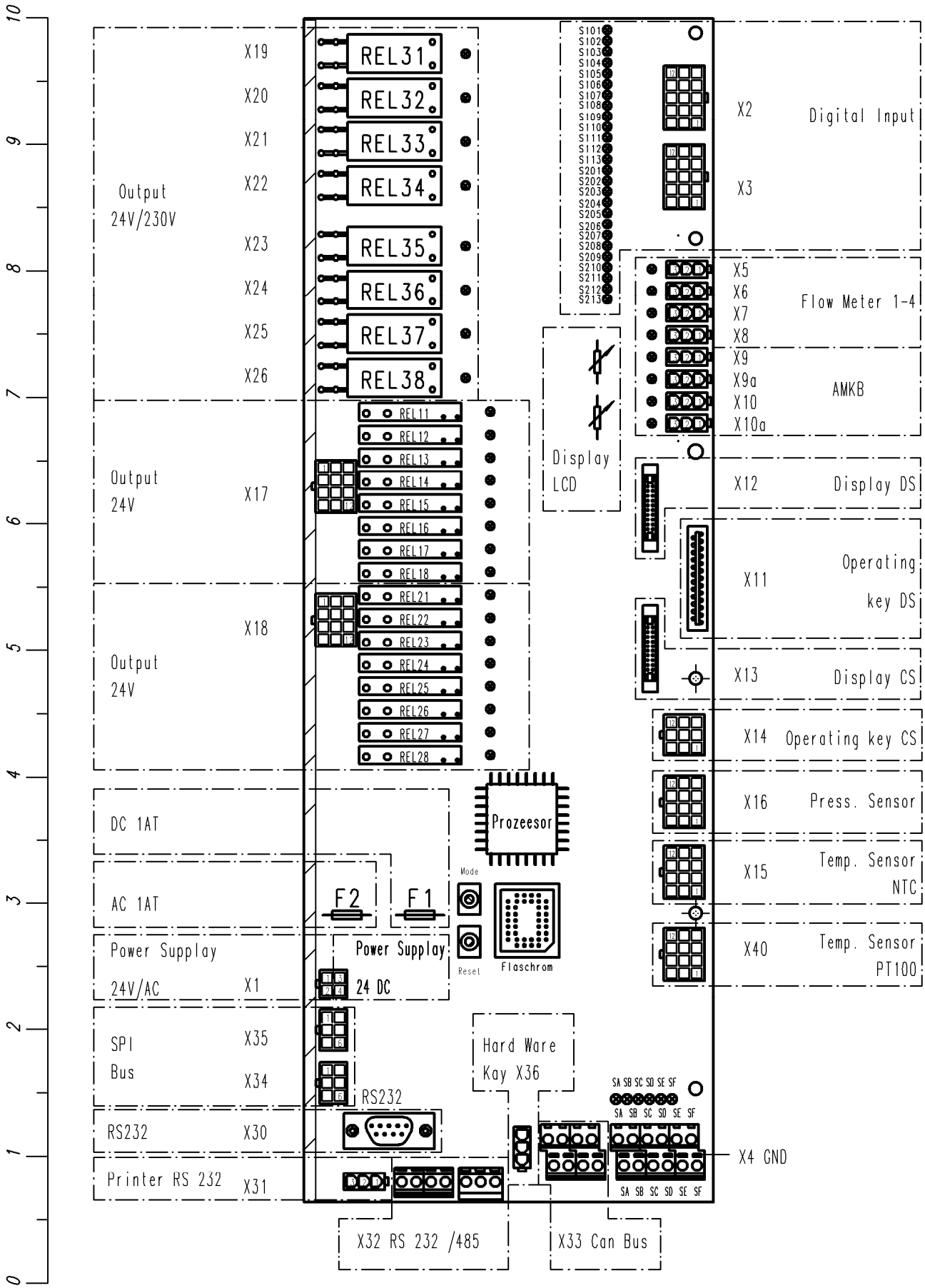


Signal in Konfiguration zuordnen

H.Hartmann 76896-030

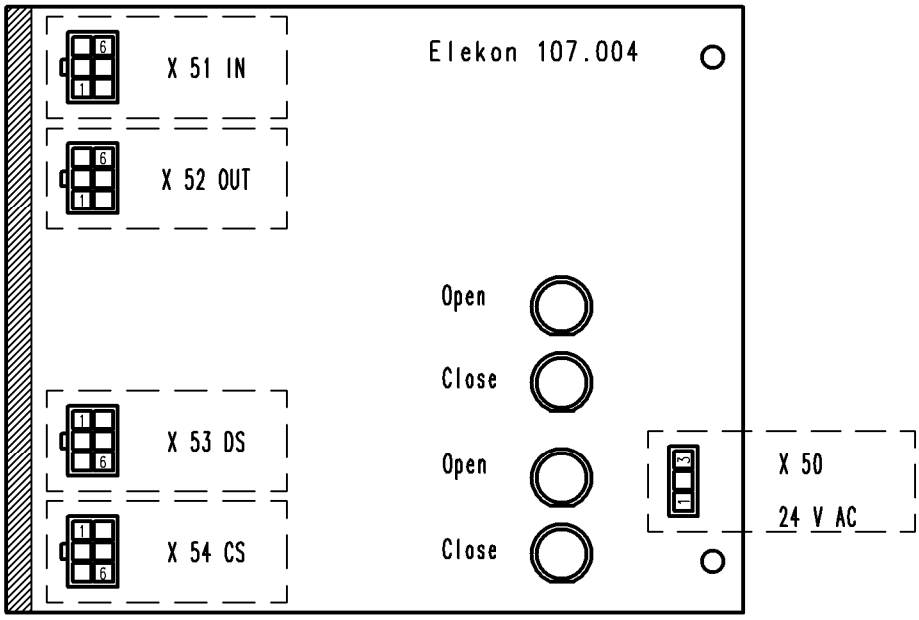
ECU 2000

ab Maschinen-Nr.:
machine number :



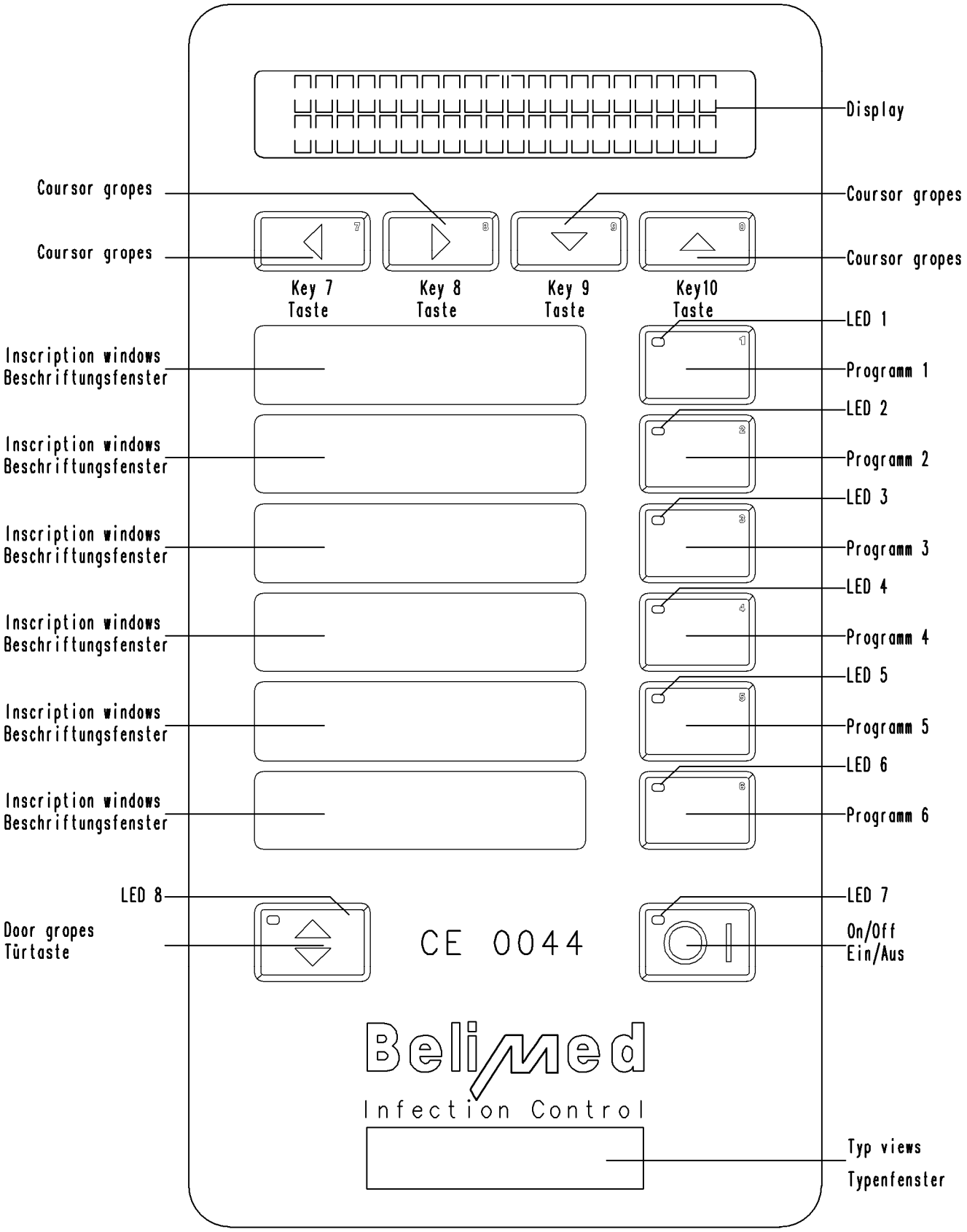
Door Pressing

machine number : | ab Maschinen-Nr.:



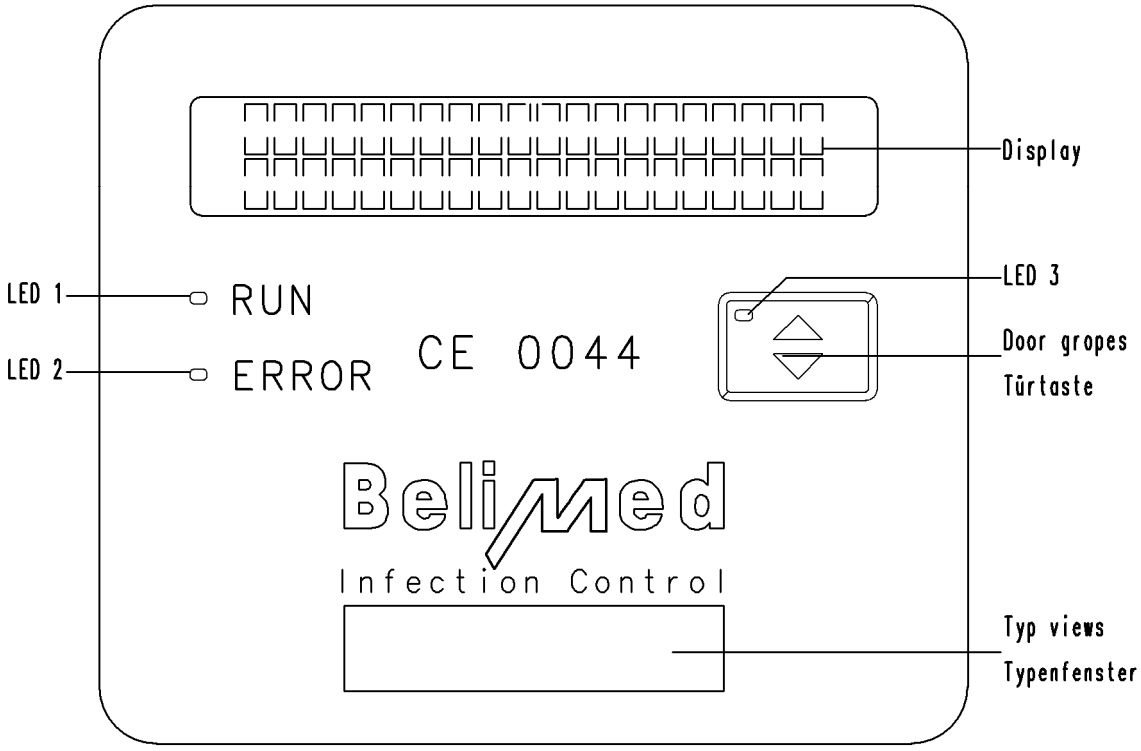
Keyboard ECD 2000 US

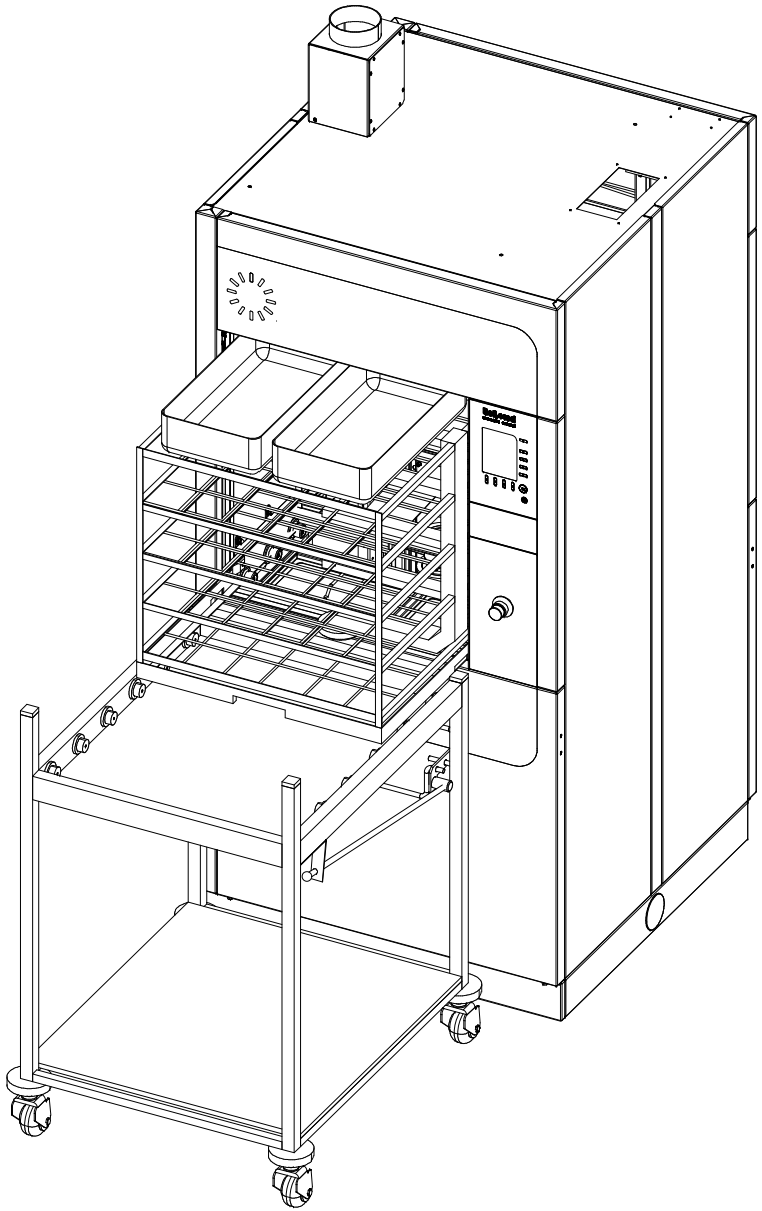
machine number : | ab Maschinen-Nr.:



Keyboard ECD 2000 RS

machine number : | ab Maschinen-Nr.:





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01	101648	18.01.2010	FM	Datum	19.04.2010
02	101726	01.02.2010	FM	Bearb.	HA
03	101622	30.11.2010	HA	Gepr.	KP
				Freig.	GE

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Titelblatt title sheet
WD290 09

77773	03	0	Seriennummer / serial number:
			9940X.XXXXXXX
Artikelnummer	Index	Blatt	Ab Produktionsdatum
			11.2010

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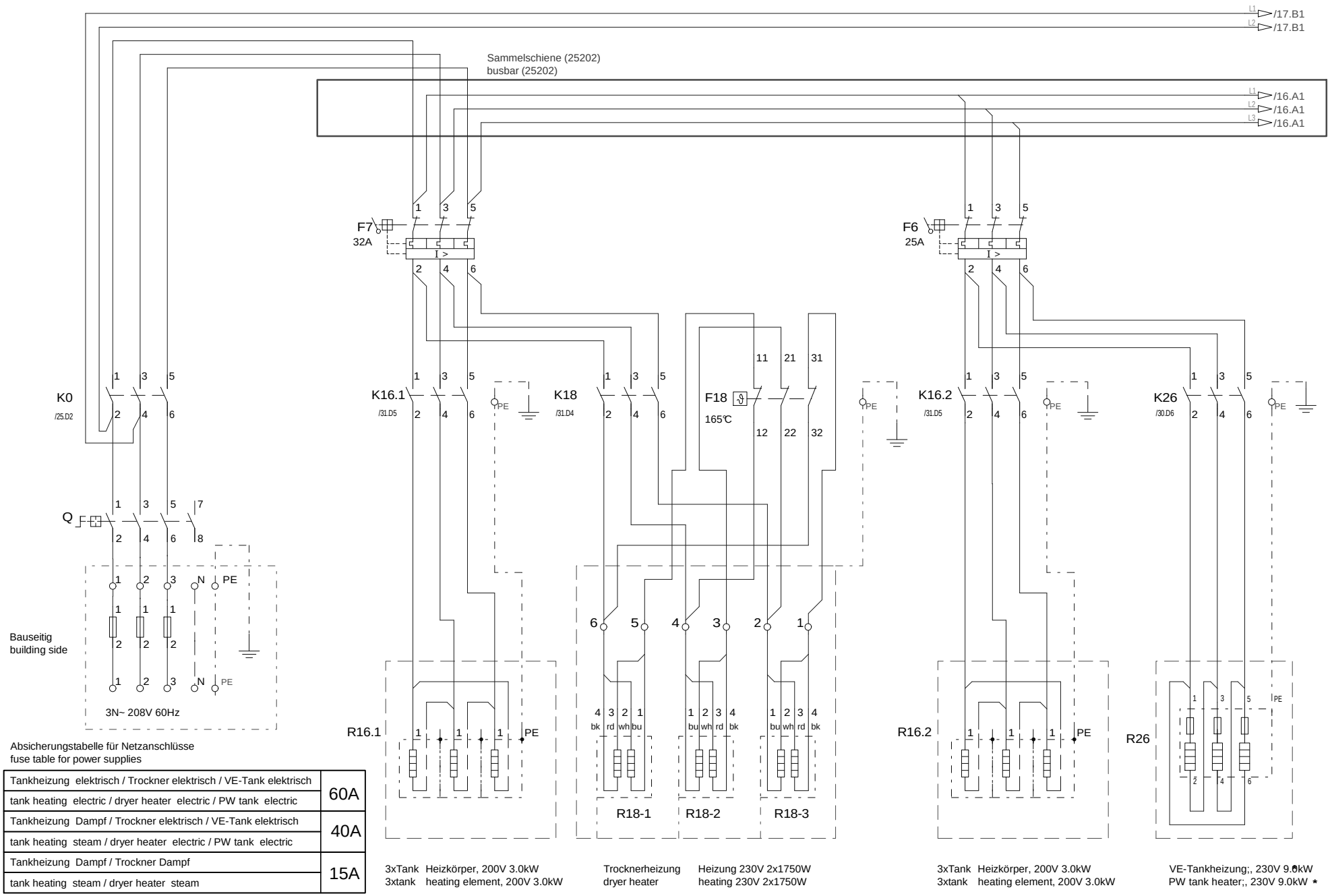

Absicherungstabelle für Netzanschlüsse
fuse table for power supplies

Tankheizung elektrisch / Trockner elektrisch / VE-Tank elektrisch	60A
tank heating electric / dryer heater electric / PW tank electric	
Tankheizung Dampf / Trockner elektrisch / VE-Tank elektrisch	40A
tank heating steam / dryer heater electric / PW tank electric	
Tankheizung Dampf / Trockner Dampf	15A
tank heating steam / dryer heater steam	

***optional**

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Heizungen / Heatings
WD290 208V 60Hz

Artikelnummer	Index	Blatt	Seriennummer / serial number:
77773	03	15	9940X.XXXXXXX
			Ab Produktionsdatum 11.2010

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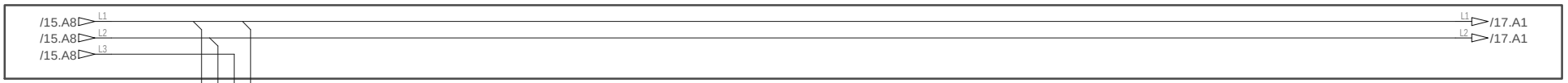
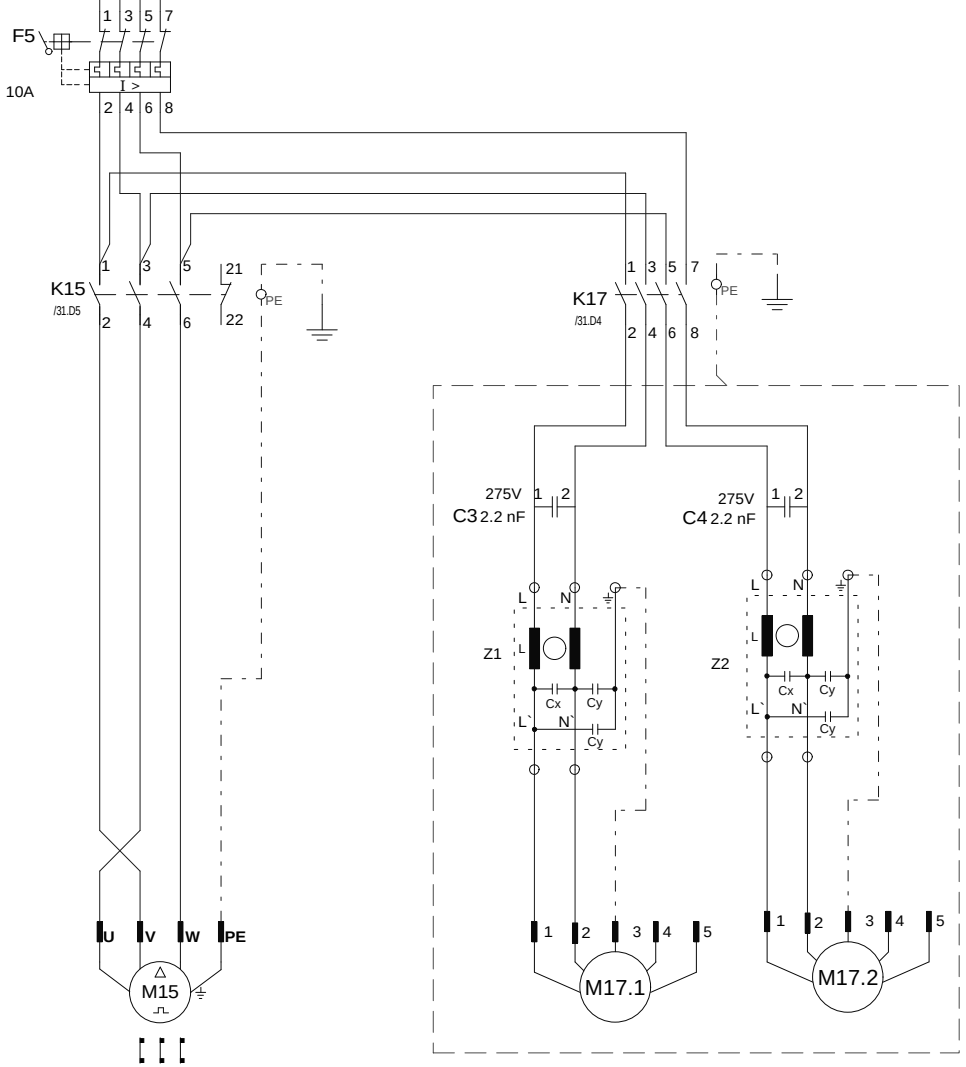
Sammelschiene (25202)
busbar (25202)

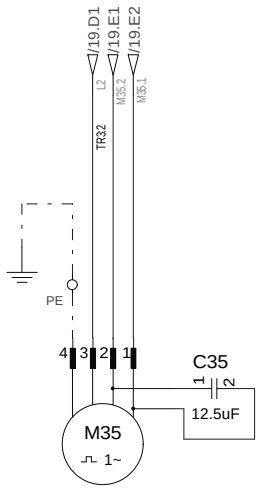




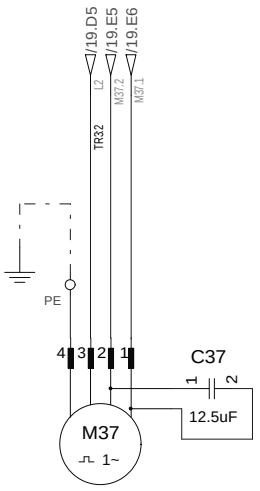
Umwälzpumpe 208V 60Hz 2.2kW
circulation pump 208V 60Hz 2.2kW

Gebläsemotor 240V 50/60Hz
blower motor 240V 50/60Hz

Gebläsemotor 240V 50/60Hz
blower motor 240V 50/60Hz



Getriebemotor 209V 60Hz 1:75
gear motor 209V 60Hz 1:75



Getriebemotor 209V 60Hz 1:75
gear motor 209V 60Hz 1:75

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				Freig.	GE

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Motoren motors
WD290 208V 60Hz

77773	03	16	Seriennummer / serial number: 9940X.XXXXXXX
Artikelnummer	Index	Blatt	Ab Produktionsdatum 11.2010

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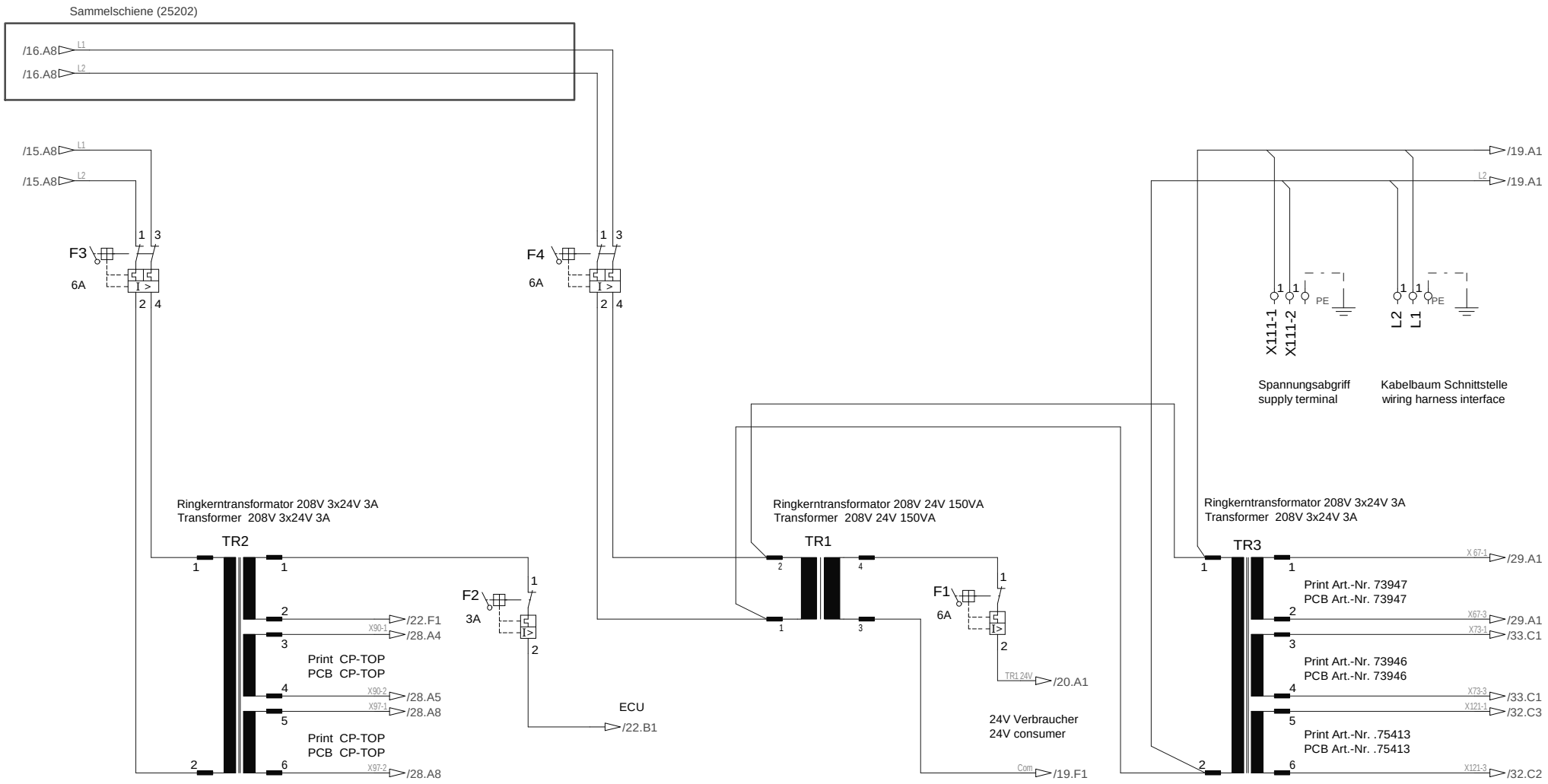

Index	Änderung	Datum	Name		
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				Freig.	GE

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24V Spannungsversorgung 24V power supply WD290 208V 60Hz

Artikelnummer	Index	Blatt	Seriennummer / serial number:
77773	03	17	9940X.XXXXXXX
			Ab Produktionsdatum 11.2010

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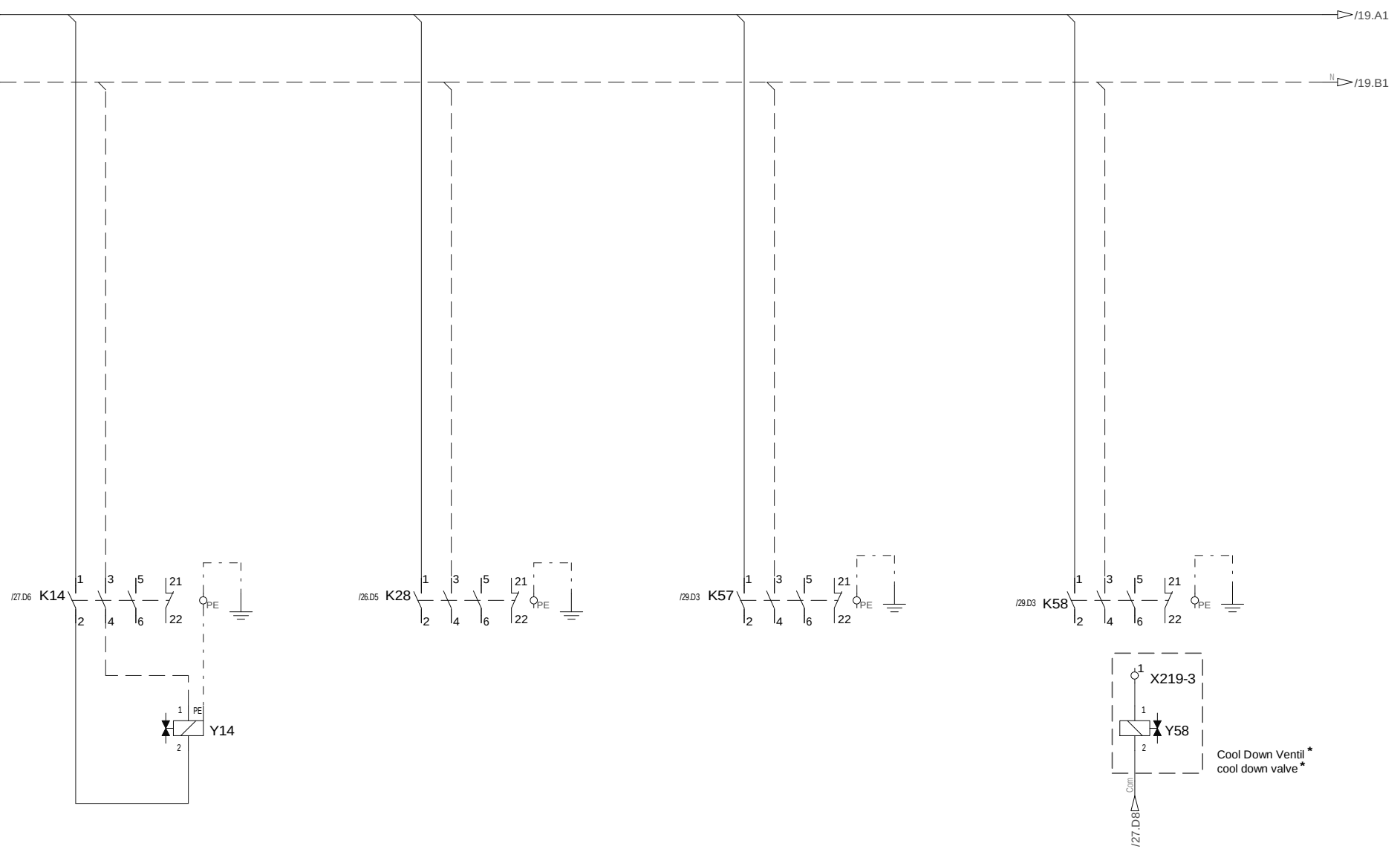

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Signale / Signals

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77773	03	18	9940X.XXXXXXX
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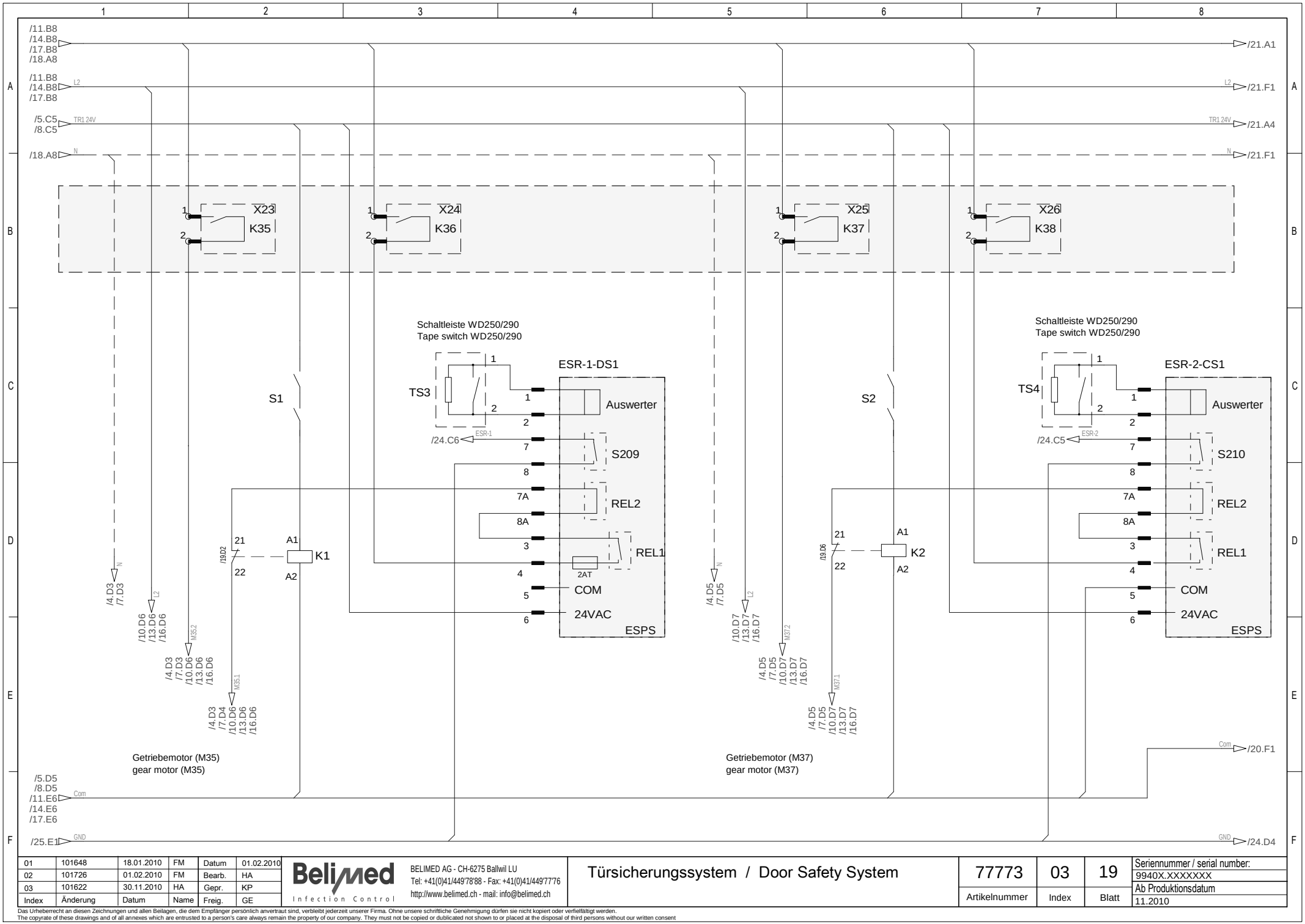

Index	Änderung	Datum	Name	Freig.	GE
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Türsicherungssystem / Door Safety System

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77773	03	19	9940X.XXXXXXX
			Ab Produktionsdatum 11.2010

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/14.D6
/17.D6
/21.A8

TR1 24V

TR1 24V /26.C1

Türanpressprint linear
door print linear

BS/LS

ES/US

X50
24 VAC
Com
2AT
3
2
1

X51
Signal
+24V
GND
Signal
-
+
1 2 3 4 5 6

X52
Signal
+24 V
GND
Signal
-
+
1 2 3 4 5 6

X53
5V
Signal
GMD
Motor
Motor
6 5 4 3 2 1

X54
5V
Signal
GND
Motor
Motor
6 5 4 3 2 1

X35
CLK+
+24VDC
GND
CLK-
DATA+
DATA-
1 2 3 4 5 6

bk 6
ye 5
gy 4
bl 2
rd 1

M41

M42

ECU 84000 Prozessorkarte
ECU 84000 processor card

Linearantrieb 24V
linear drive 24V
Beladeseite
loading side

Linearantrieb 24V
linear drive 24V
Entladeseite
unloading side

/19.E8 Com

Com /21.F4

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03	101622	30.11.2010	HA	Gepr.	KP
Index	Änderung	Datum	Name	Freig.	GE

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Türanpressung / Door Pressure

77773	03	20	Seriennummer / serial number:
			9940X.XXXXXXX
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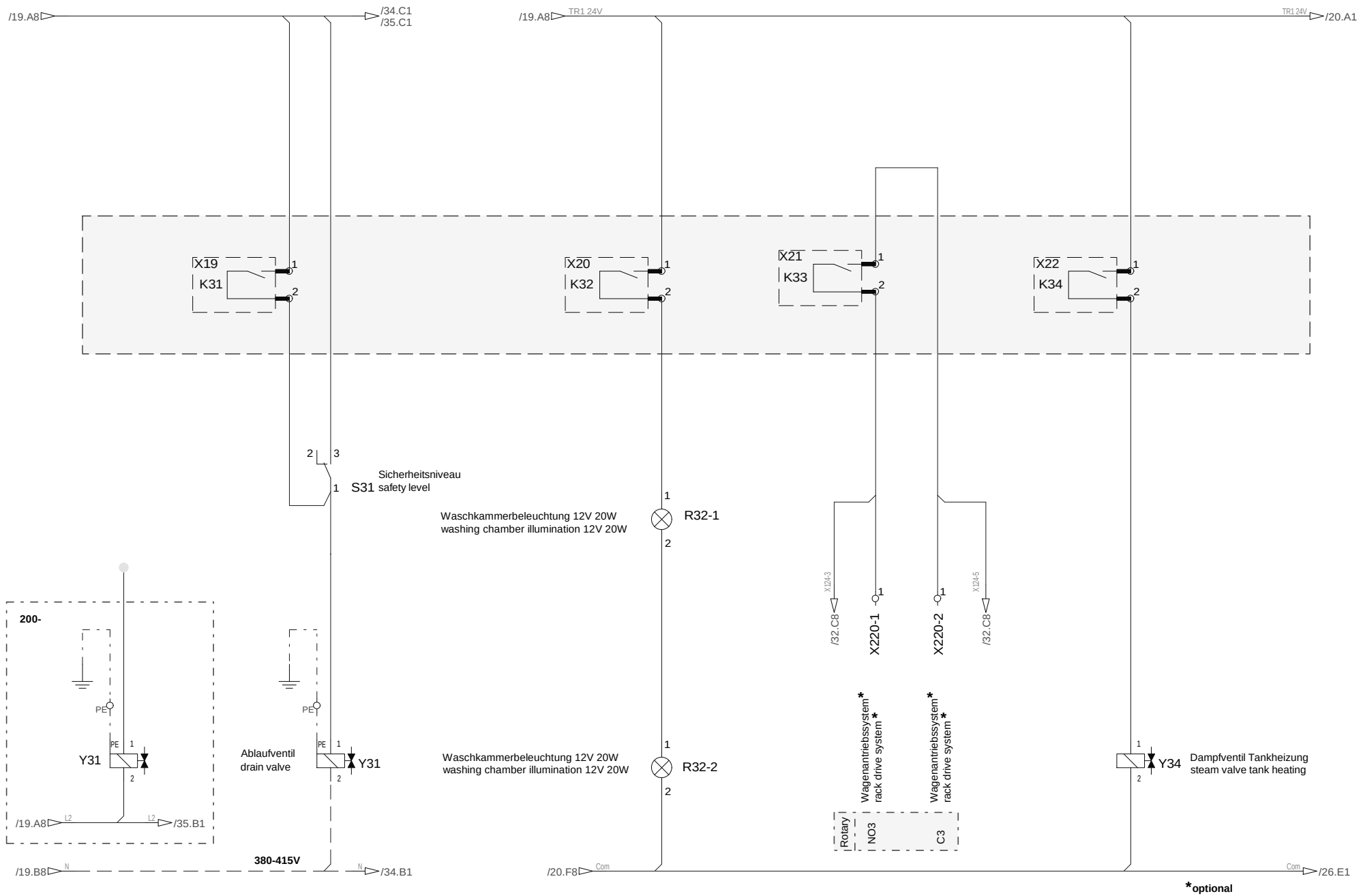

Index	Änderung	Datum	Name	Freig.	GE
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Ausgangs Relais / Output Relais

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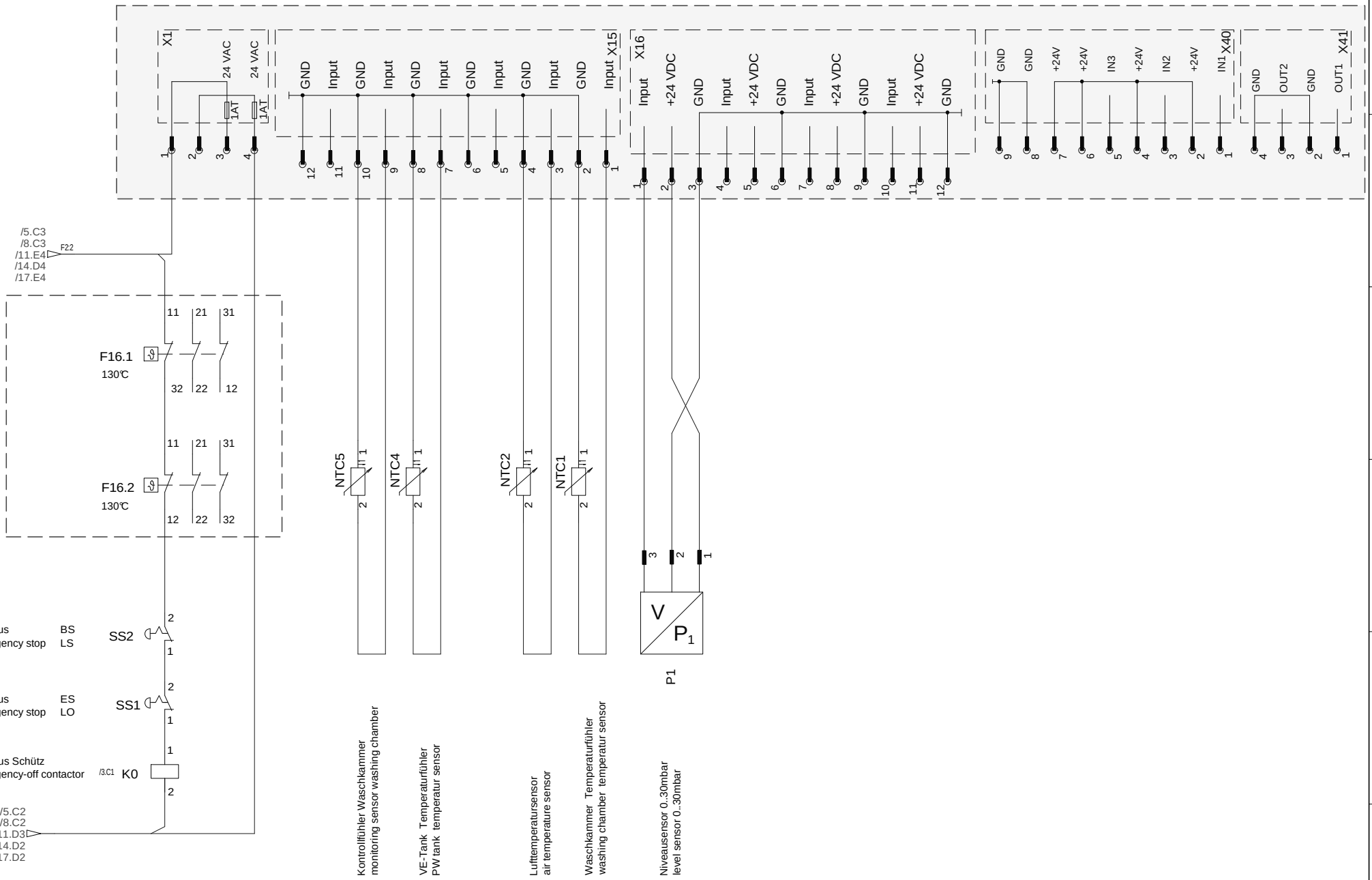

Index	Änderung	Datum	Name	Freig.	GE
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Analog / Analog

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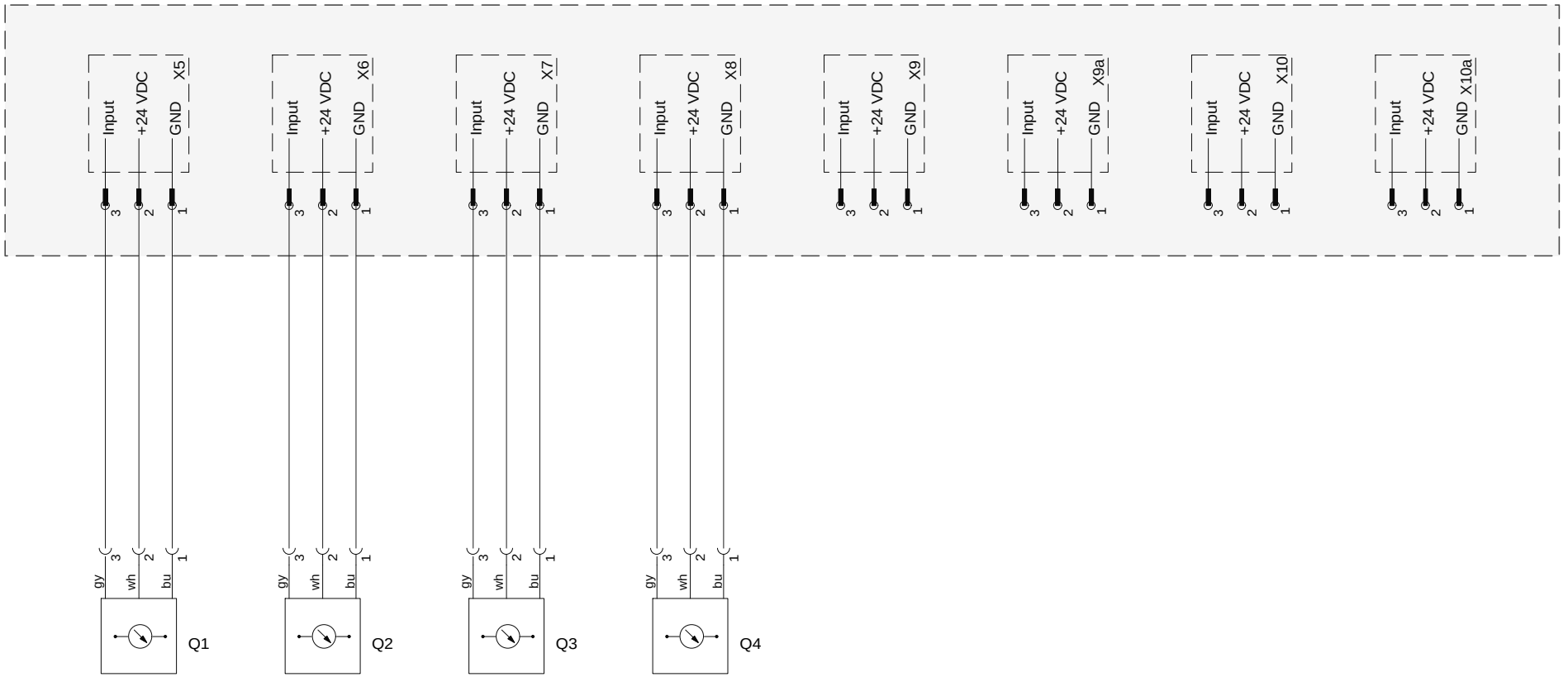

Durchflussmesser Dosierpumpe 1
flow meter dosing pump 1

Durchflussmesser Dosierpumpe 2
flow meter dosing pump 2

Durchflussmesser Dosierpumpe 3
flow meter dosing pump 3

Durchflussmesser Dosierpumpe 4*
flow meter dosing pump 4*

***optional**

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03	101622	30.11.2010	HA	Gepr.	KP
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Durchflussmesser / Flow Meter

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77773	03	23	9940X.XXXXXXX
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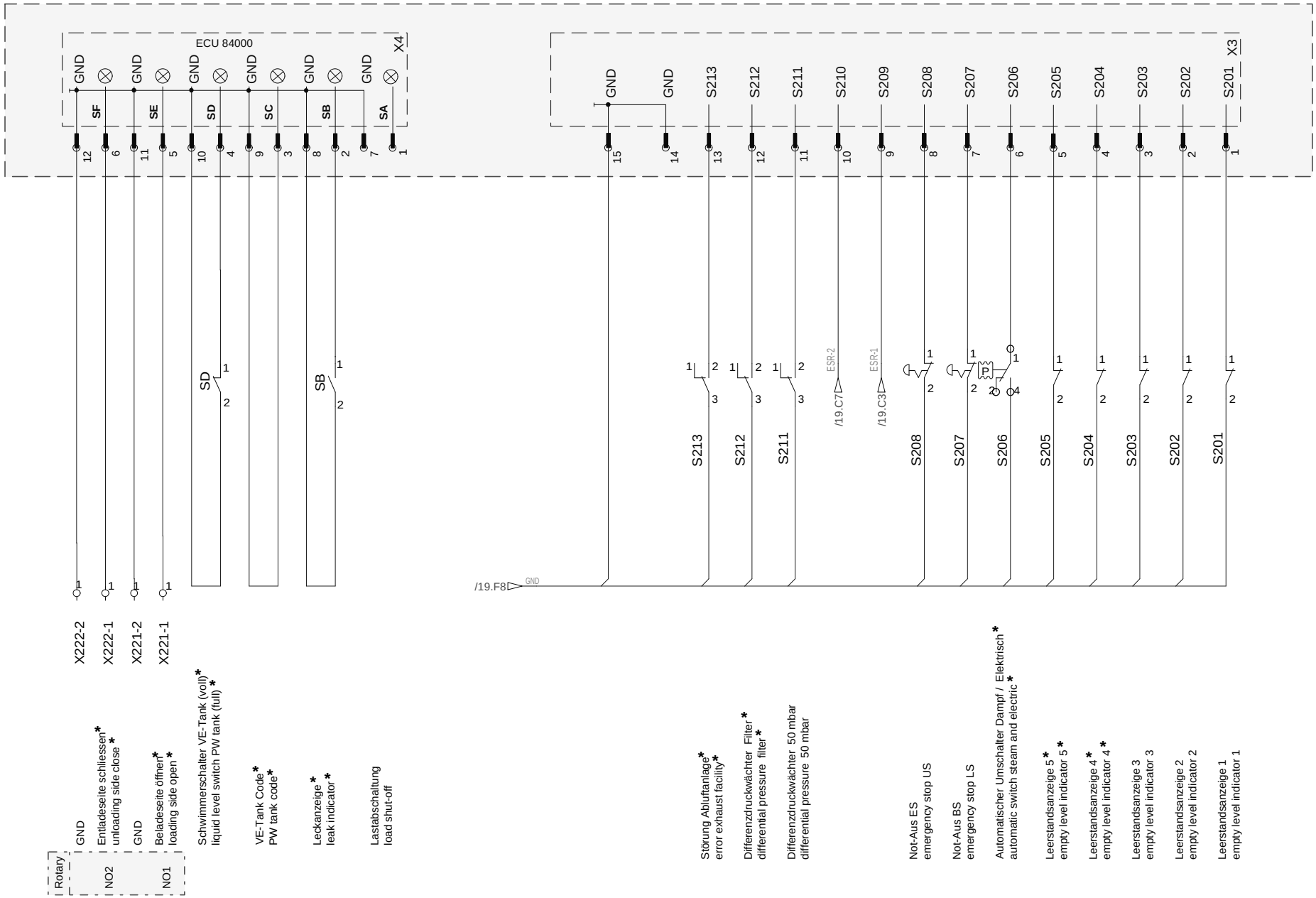

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01	101648	18.01.2010	FM	Datum	19.04.2010
02	101726	01.02.2010	FM	Bearb.	HA
03	101622	30.11.2010	HA	Gepr.	KP

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77773	03	24	9940X.XXXXXXX
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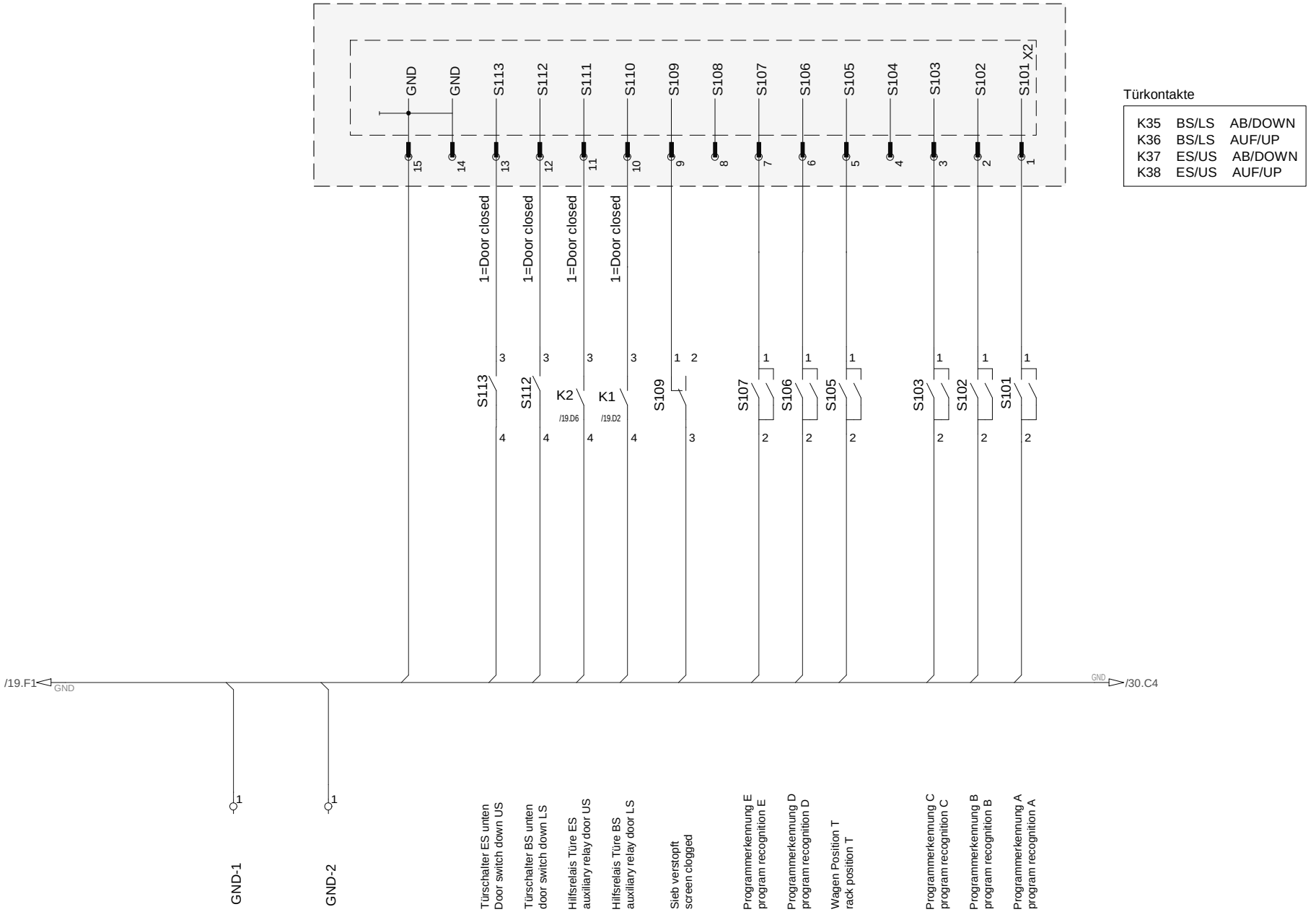

Türkontakte

K35	BS/LS	AB/DOWN
K36	BS/LS	AUF/UP
K37	ES/US	AB/DOWN
K38	ES/US	AUF/UP

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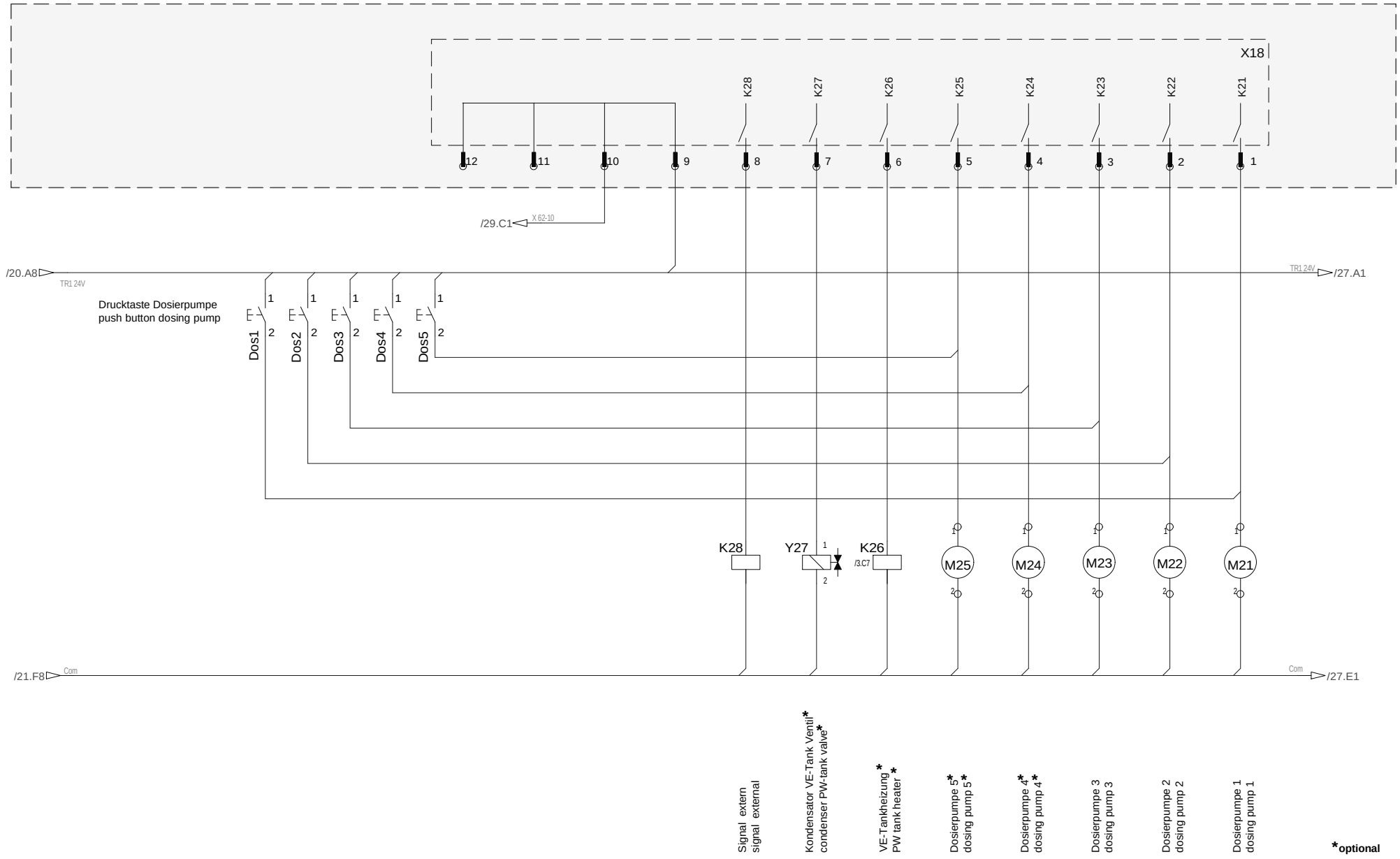

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Digital Ausgänge Digital outputs

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77773	03	26	9940X.XXXXXXX
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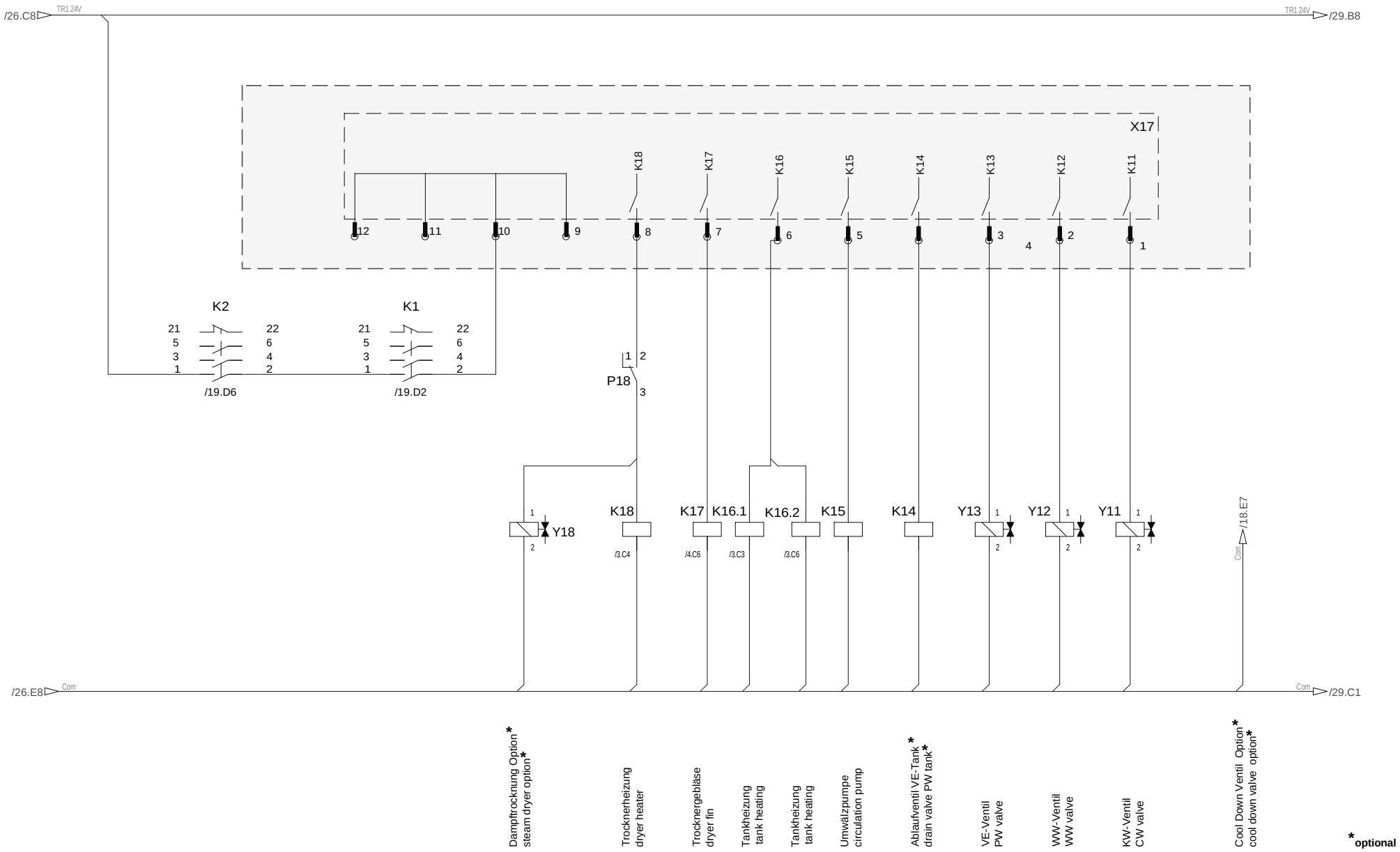

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Digital Ausgänge Digital outputs

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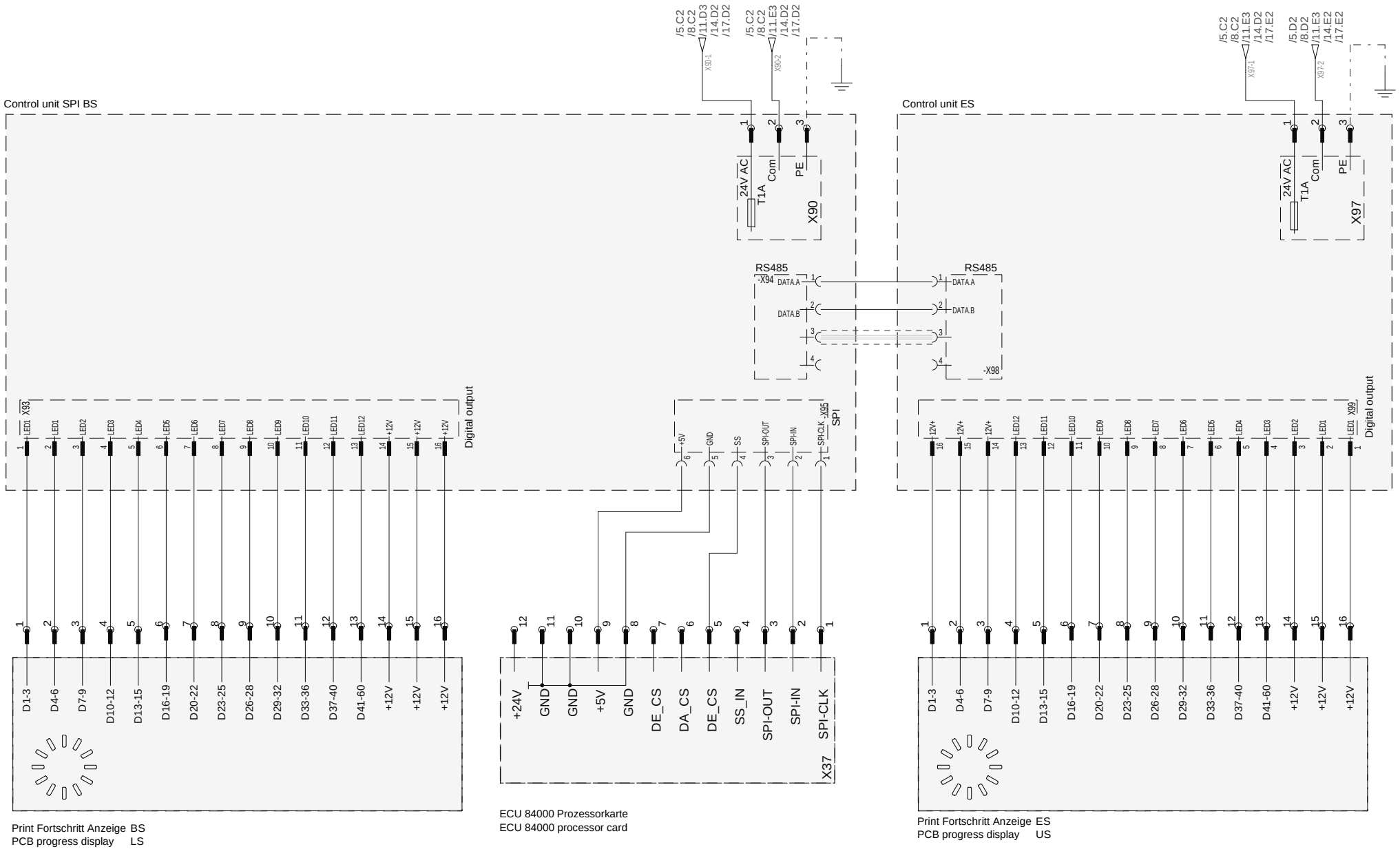

Print Fortschritt Anzeige BS
PCB progress display LS

ECU 84000 Prozessorkarte
ECU 84000 processor card

Print Fortschritt Anzeige ES
PCB progress display US

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Bedieneinheit / Operating Unit

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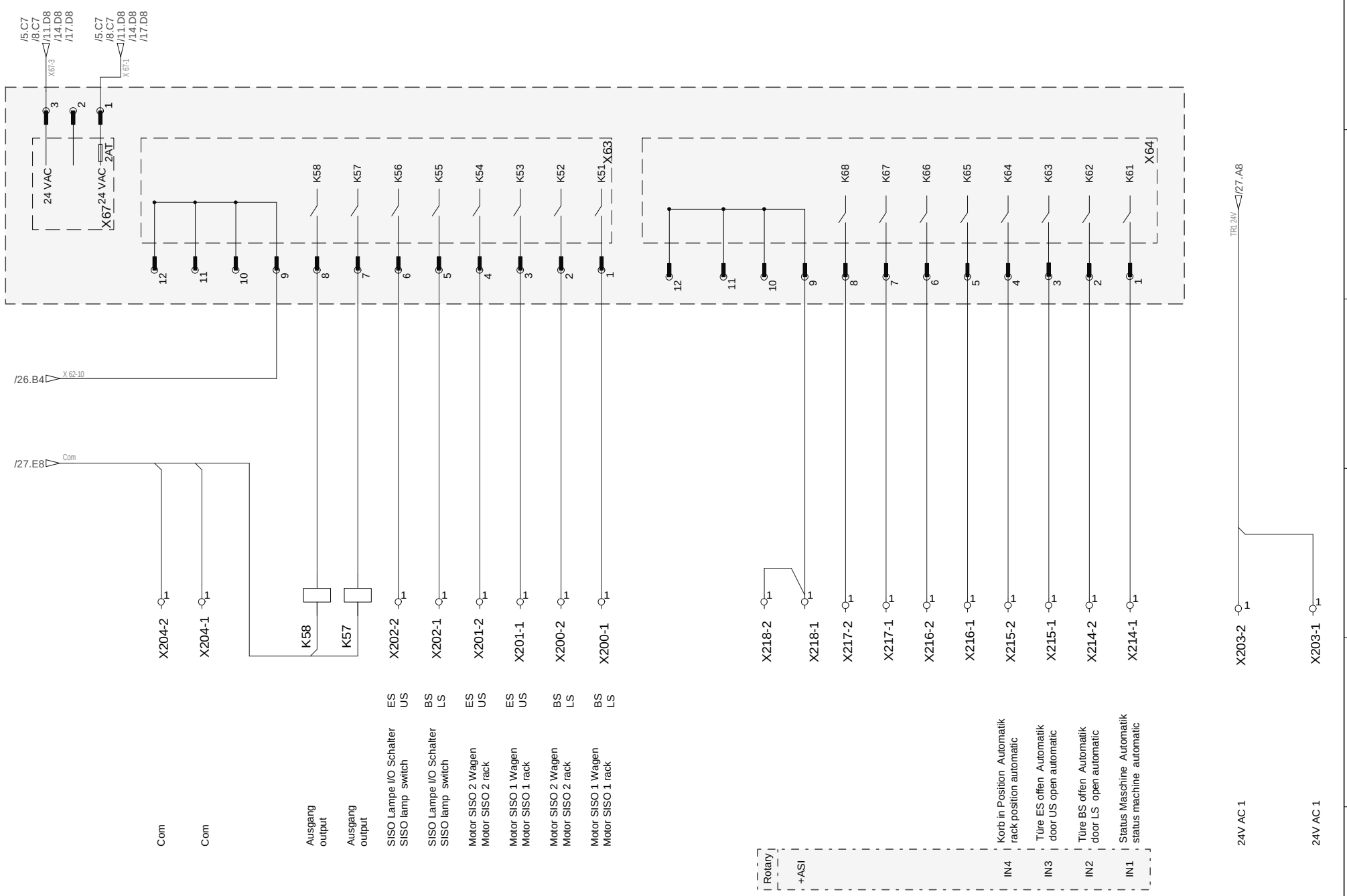
/5.C7 /8.C7 /11.D8 /14.D8 /17.D8
X67:3
X67:1
24 VAC
X67 24 VAC 2AT
X63
X64
K58 K57 K56 K55 K54 K53 K52 K51
K68 K67 K66 K65 K64 K63 K62 K61
/26.B4 X 62-10
/27.E8 Com
/27.A8 TR1 24V
X204-2 X204-1 K58 K57 X202-2 X202-1 X201-2 X201-1 X200-2 X200-1
X218-2 X218-1 X217-2 X217-1 X216-2 X216-1 X215-2 X215-1 X214-2 X214-1
X203-2 X203-1
Com
Com
Ausgang output
Ausgang output
SISO Lampe I/O Schalter SISO lamp switch ES US
SISO Lampe I/O Schalter SISO lamp switch BS LS
Motor SISO 2 Wagen Motor SISO 2 rack ES US
Motor SISO 1 Wagen Motor SISO 1 rack ES US
Motor SISO 2 Wagen Motor SISO 2 rack BS LS
Motor SISO 1 Wagen Motor SISO 1 rack BS LS
Rotary
+ASI
IN4 Korb in Position Automatik rack position automatic
IN3 Türe ES offen Automatik door US open automatic
IN2 Türe BS offen Automatik door LS open automatic
IN1 Status Maschine Automatik status machine automatic
24V AC 1
24V AC 1

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Datum	19.04.2010		
Bearb.	HA		
Gepr.	KP		
Freig.	GE		

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Zusätzliche Ausgänge / Additional Output

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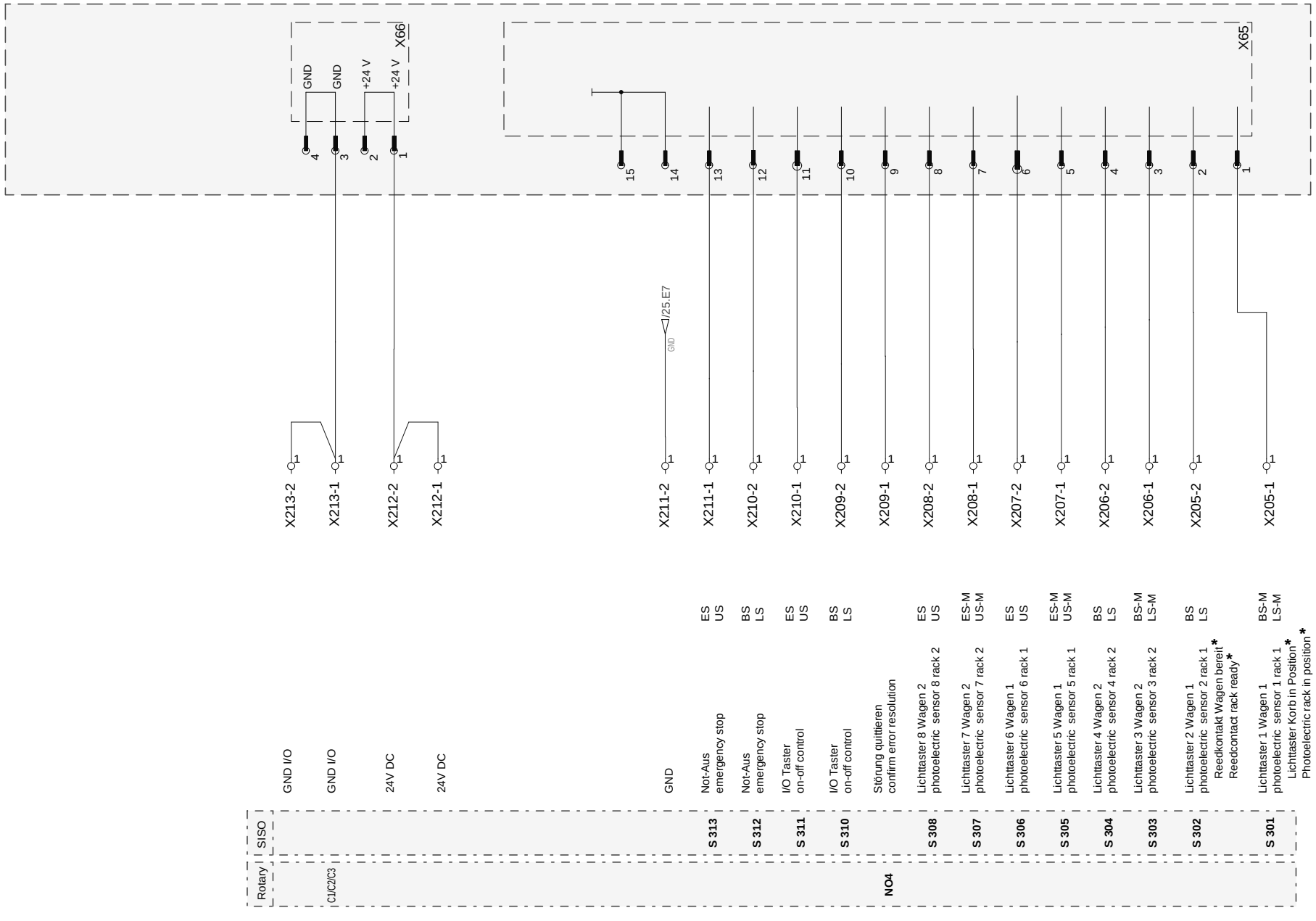

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Zusätzliche Eingänge / Additional Inputs

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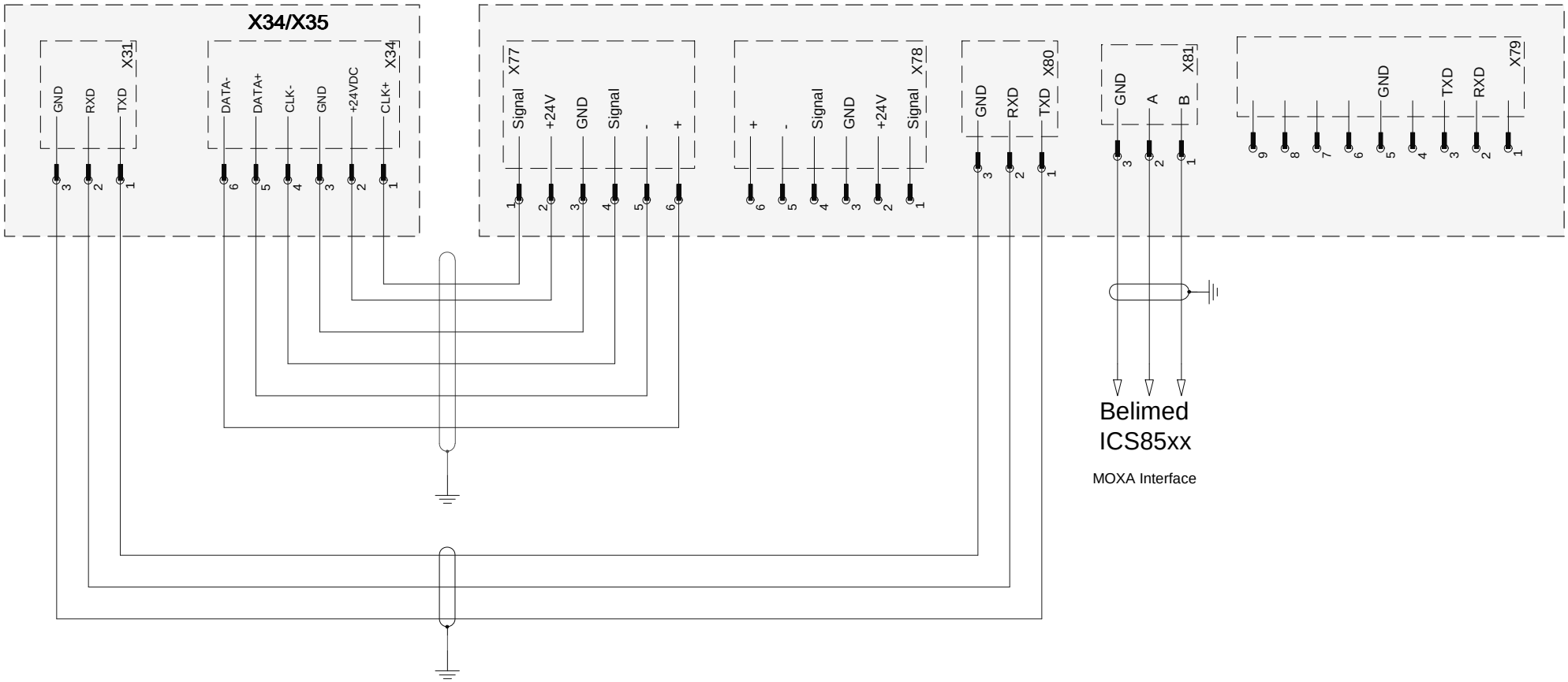

01	101648	18.01.2010	FM	Datum	19.04.2010
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IPD / ICS 85XX

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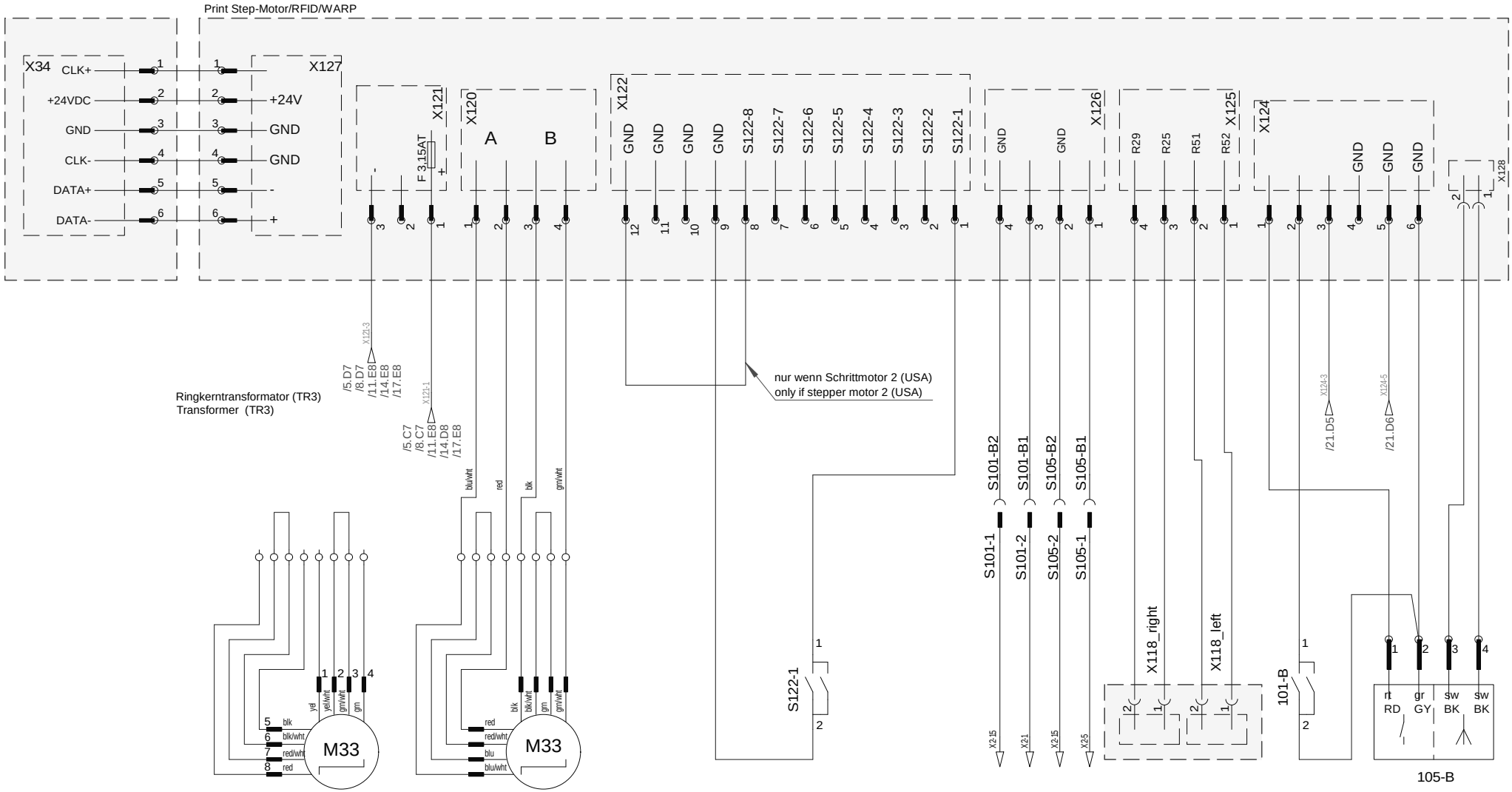

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Step-Motor/RFID/WARP

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77773	03	32	9940X.XXXXXXX

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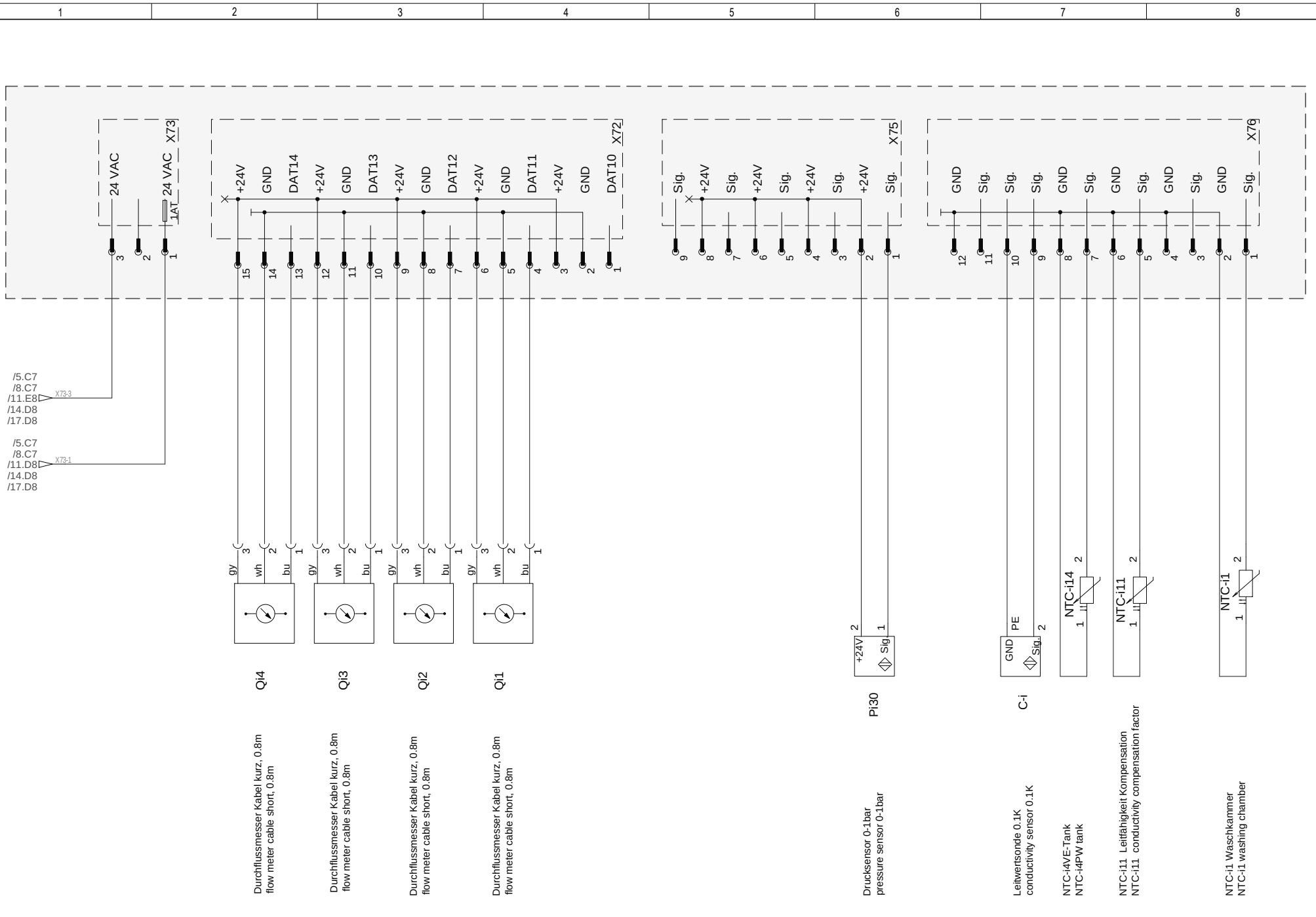

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				Freig.	GE

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Option IPD

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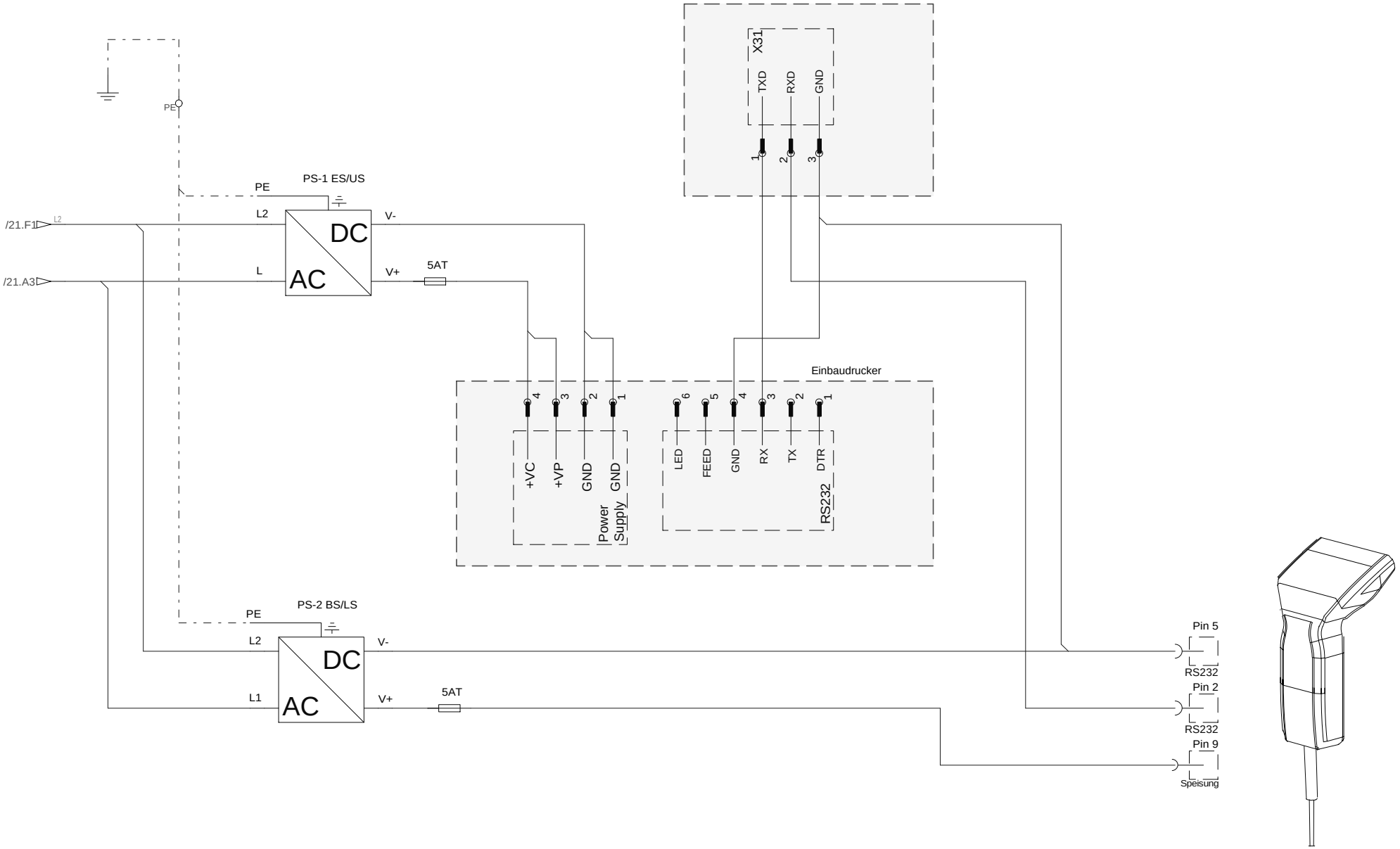
Netzteil Typ SPS-25-05, Input: 80-264VAC 47-63Hz Output: 5.0VDC 5A 25W
power supply Typ SPS-25-05, Input: 80-264VAC 47-63Hz Output: 5.0VDC 5A 25W



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Index	Änderung	Datum	Name	Freig.	GE

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200-220V Option Drucker Scanner / 200-220V Option Printer Scanner

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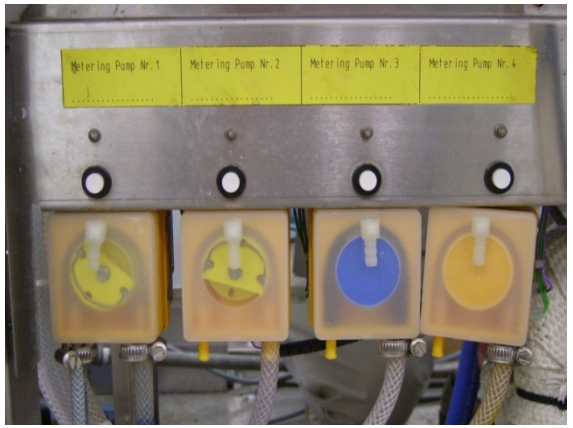
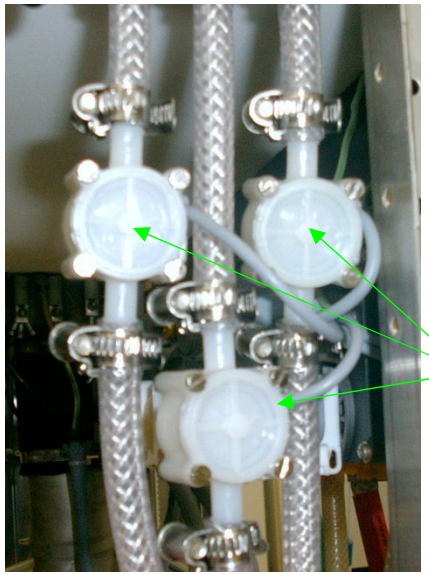
Dosing system

Maximum suction length 10 m

Specialized squeeze tubes:
- Viton (black) for lubricants
- Silicon (white) for chemicals

Alk Neu Lub Enz



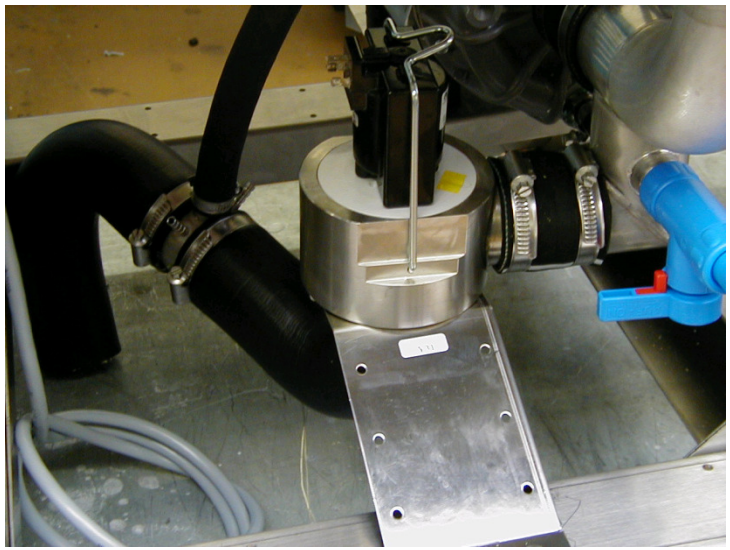


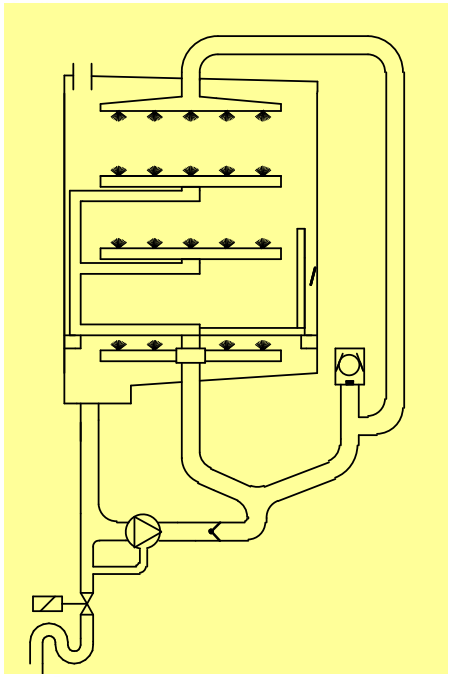
Flow meters for assured delivery of chemical. When installed they will alarm for safety and abort the cycle.

Belimed
Infection Control

Drain valve

- Very significant drainage rate (drain valve DN 50)
- No residual water; all water-leading sections are drained by the drain valve
- No dead angles
- All pipes are made of Stainless Steel

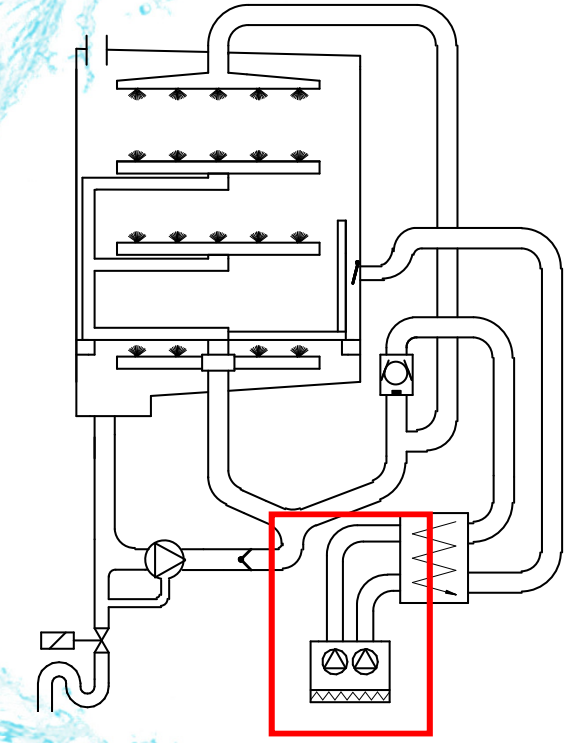


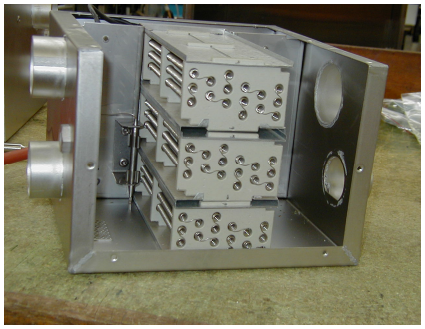


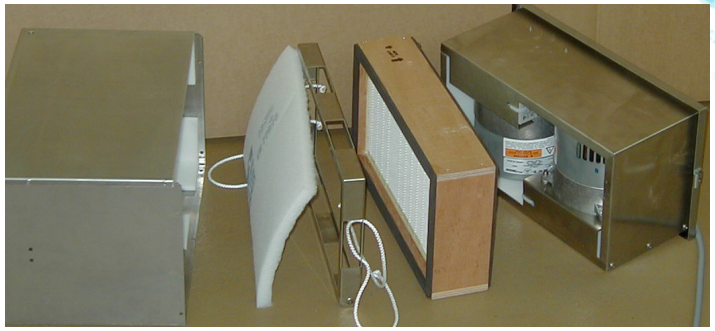
Belimed
Infection Control

Drying

- Internal and external hot air drying
- Low noise level <58 dB (A)
- Drying time for 15 DIN trays 8 min.
- High performance : 500 m3 / h
- Electrical heated, performance 10.5 KW
- 2 brushless turbines, maintenance-free







Belimed
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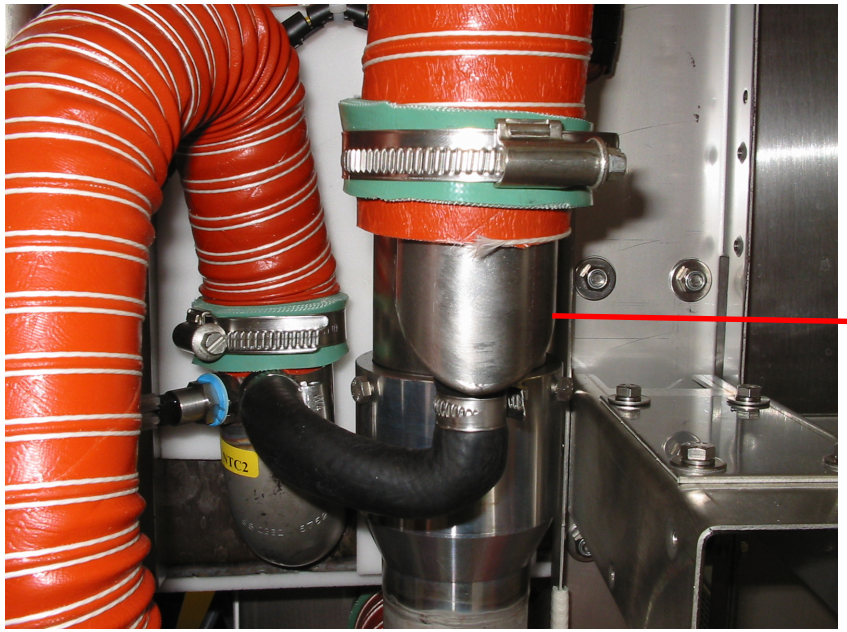
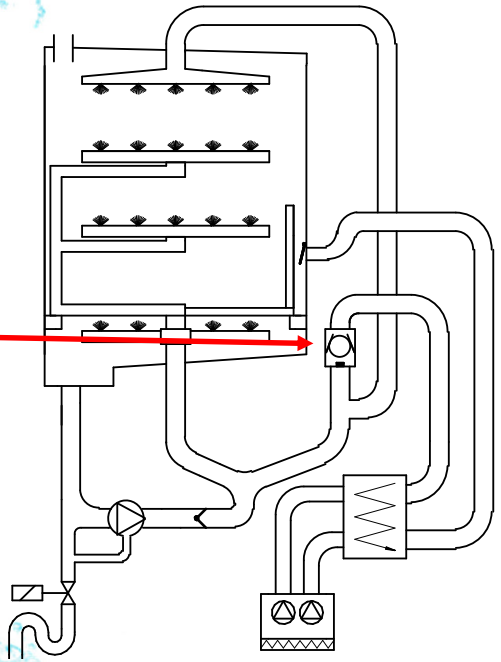
Drying system

Separation of air and water systems

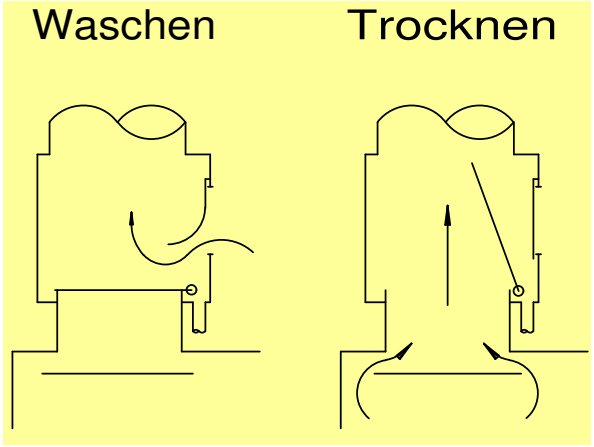




Belimed
Infection Control

Drying system

- With high wash temperatures, the exhaust damper reduces the heat loss through exhaust air.
- The ambient air flap prevents the removal of heat energy by the building's vent system.
- The flap prevents heat loss during heating.
- The damper is equipped with an air condensate drain.
- Exhausts 100% humidity



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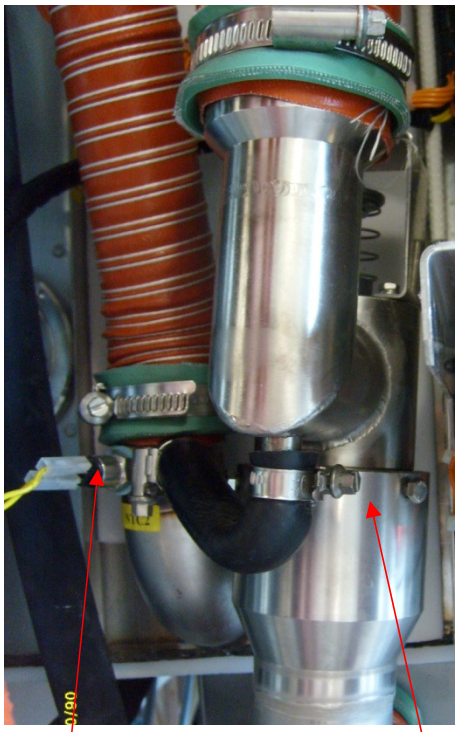
Drying system components

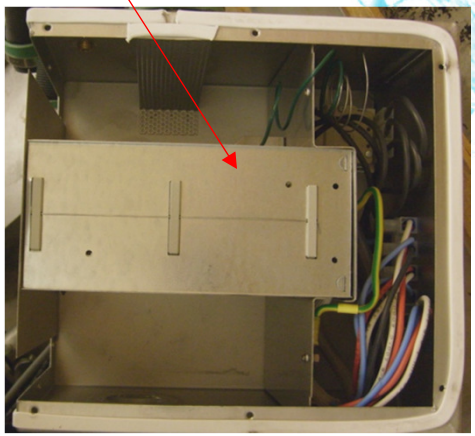


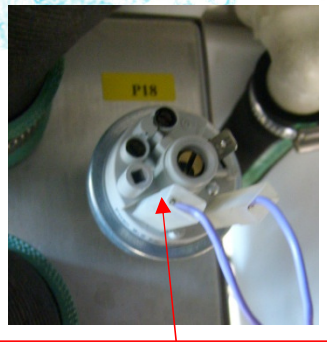
T2 Sensor

2” Check valve

Exhaust Pot

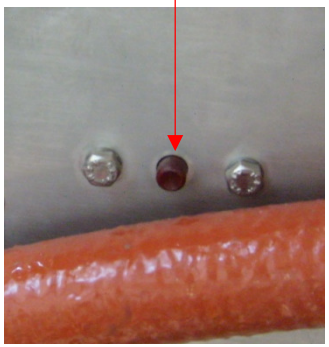
Box Elements





P18 Pressure switch

Over-temp reset



Belimed Infection Control

Door system

Glass sliding door technology

- Integrated, vertically opening glass doors for visual monitoring
- Chamber illumination
- Space-efficient and safe downward opening
- Double-wall safety glass (outside) and insulation glass (inside)
- Electrical contact pressure against seal, no pneumatics required
- High operating safety with crushing protection shutdown on the upper edge of the door

Beli/med
Infection Control

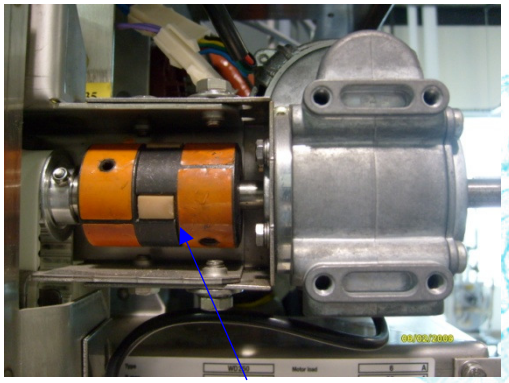
Door drive sequence

- Open Door
  - Linear door motor extends to pull door away from seal
    - Linear pot set point calibrated in system config. (Range from 1-32)
  - Lower door relay activates to drive door down (to open position)
    - Relay output DS K35 or CS K37
    - Door activates lower door switch DS S112 or CS S113
- Close Door
  - Raise door relay activates to drive door up (to closed position)
    - Relay output DS K34 or CS K36
    - Door drive engaged through Tape Switch Relay DS K3 or CS K4
      - If tape switch interrupted, door drive relay is not energized, Alarm and Error code displayed
    - Door activates upper door switch DS S1/S110 or CS S2/S111 (K1/K2 close)
  - Linear door motor retracts to seal door to .6 amps
  - Linear pot reading is checked to the calibrated set point in (Range from 153-255)

Belimed
Infection Control

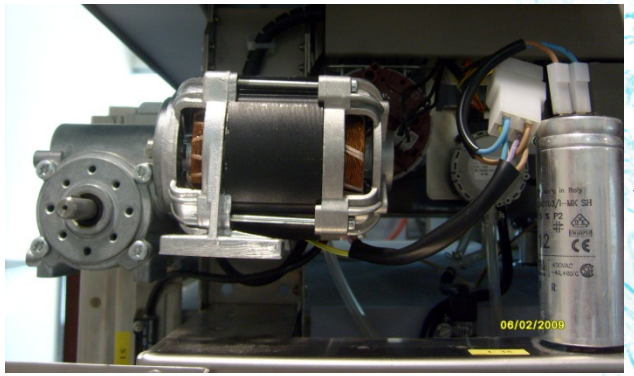
Door drive components

Linear Door Drive



Door Drive Motor

Door Safety Switch Relay



Start Capacitor

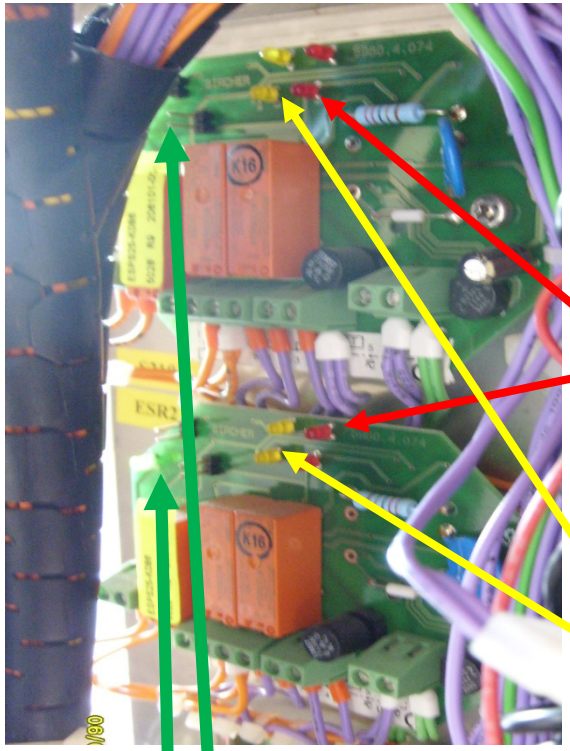
S110/S1 Upper door switch

Belimed

Infection Control

Door drive components

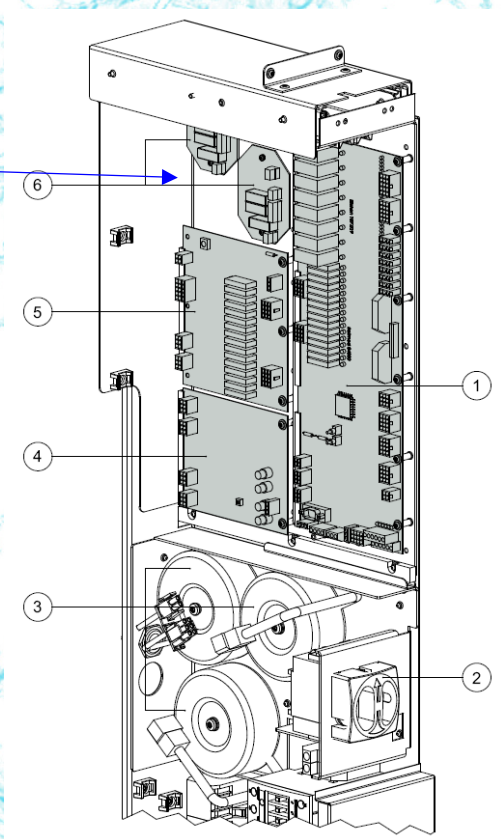
Door Switch Relay



Red LED system has broken circuit

Yellow LED tape switch is activated

Green LED system is OK



Belimed Infection Control

Safety features of control system

- The following system conditions will cause a cycle interrupt:
  - Overshooting safe water level (P1=2.5 V when pump is not in operation, 3.1 V when operating).
  - Undershooting of min. water level (Tank heating elements are not immersed in water).
  - Lack of water input (water flow interrupted if within 5 minutes a level difference with a reading difference of at least 0.1 V isn't observed)
  - Drain blocked.
  - Preset water temperature is not reached.
  - Control system does not detect any change in water temperature (heater failure, reading of temperature sensor must increase by at least 1 ℃ within 5 minutes).
  - Either temperature sensor or level sensor is defective.
  - With Flow meters installed, insufficient chemical dosed
  - Doors movement (S1/S2 or Pot in Linear motor)
- Safety Features other than in Control System
  - Temperature limiters are designed to interrupt respective power circuit to protect machine and wash goods from overheating.
  - Should water level rise above door's edge, drain will open automatically by means of a pressure switch (S31).
  - Door safety switch S209/S210 will stop the door from closing if triggered by an object.

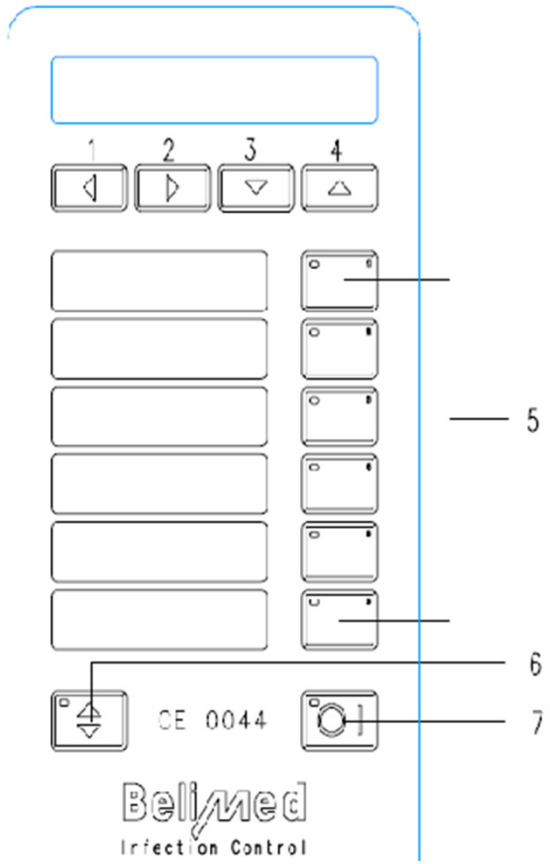
Belimed
Infection Control

WD-250/230 controls

- The control system guarantees high reliability and safe operation.
- LCD panel displays machine's actual parameters.
- Complete documentation of all process-data
- Easy programming
- 12 programs can be assigned to 6 program keys
- The last 10 error messages are stored
- Calibration of the system can be performed.

Belimed
Infection Control

Service mode



1-4 <arrow keys>
5 program keys
6 Door button
7 Reset and on/off

To obtain the machine serial number and cycle count press and hold button 7 for 4 seconds.

To access service mode press and hold button 7 for >5 seconds.

<arrow keys> 1 and 2 are for cursor functions

<arrow keys> 3 and 4 are for scrolling - value is saved at time of exit.

Door switch 6 to move to the subsequent display

IO button 7 to move back a display and exit

Belimed
Infection Control

Analysis

1. Analysis
2. Dosing
3. Controls
4. Parameter
5. Configuration
6. Limits

Query of a variety of current values (sensors, probes, inputs..), query only, no input possible.

NTC1 = Wash chamber NTC2 = Dryer
NTC3 = Empty (--- = empty) NTC4 = DI boiler (option)

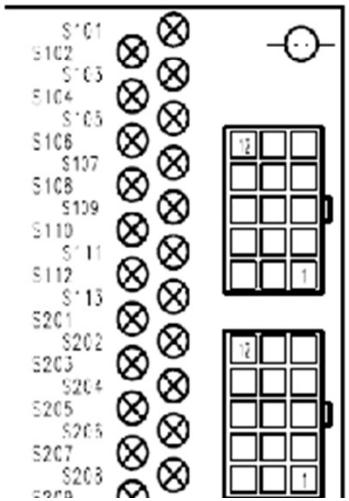
S1 01 02 03 04 05 06
1 0 0 1 0 1

L1= 1.20V L2= 1.02V
PL= 0.00V PR= 0.00V

Query the last 10 error codes.

1: Error **111** **P3** **S2.1**
13.12.2000 | 16:44

Test rack recognition.



X2

X3

Belimed
Infection Control

Dosing

1. Analysis
2. Dosing
3. Controls
4. Parameter
5. Configuration
6. Limits

Display recipes assigned to individual programs.

Input of dosing agent parameters in recipe.

1.1 Pre-rinse 36 °C
00 min HT0 D**1 5.0**ml

Calibrate dosing pump and impulse counter.

Doser *1* ***Time***

1.10 L/6Min 360

Doser 1 ***Impulse***

3700 Imp / L 2353

Belimed
Infection Control

Controls

1. Analysis
2. Dosing
3. Controls
4. Parameter
5. Configuration
6. Limits

Manual Control of individual outputs.

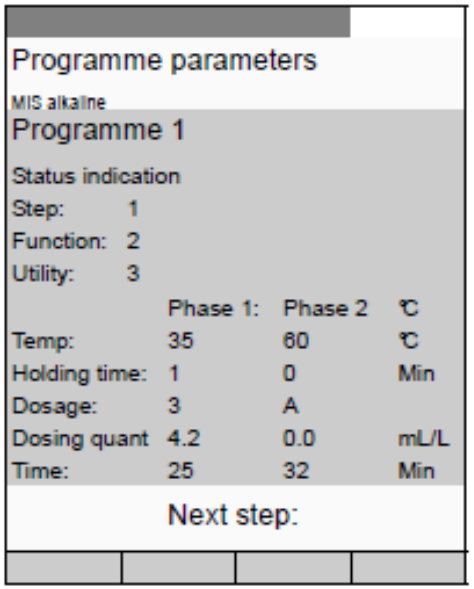
P1 P2 P3 P4 P5 P6
11 12 13 14 15 16

Y11	CW valve
Y12	WW valve
Y13	DI valve
K14	Pump DI tank /tank
K15	Re-circulation pump

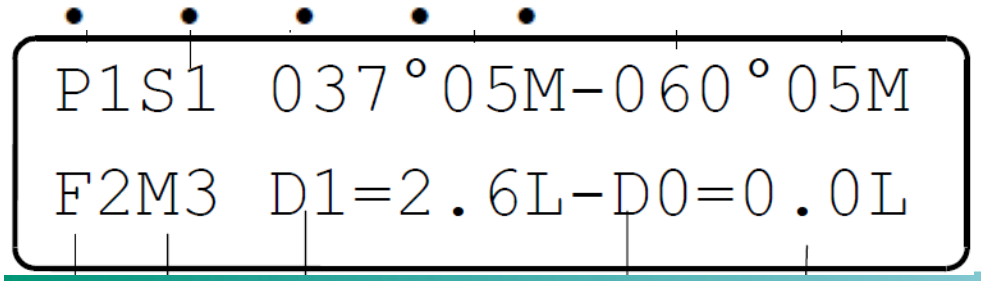
Belimed
Infection Control

Parameter

1. Analysis
2. Dosing
3. Controls
4. Parameter
5. Configuration
6. Limits

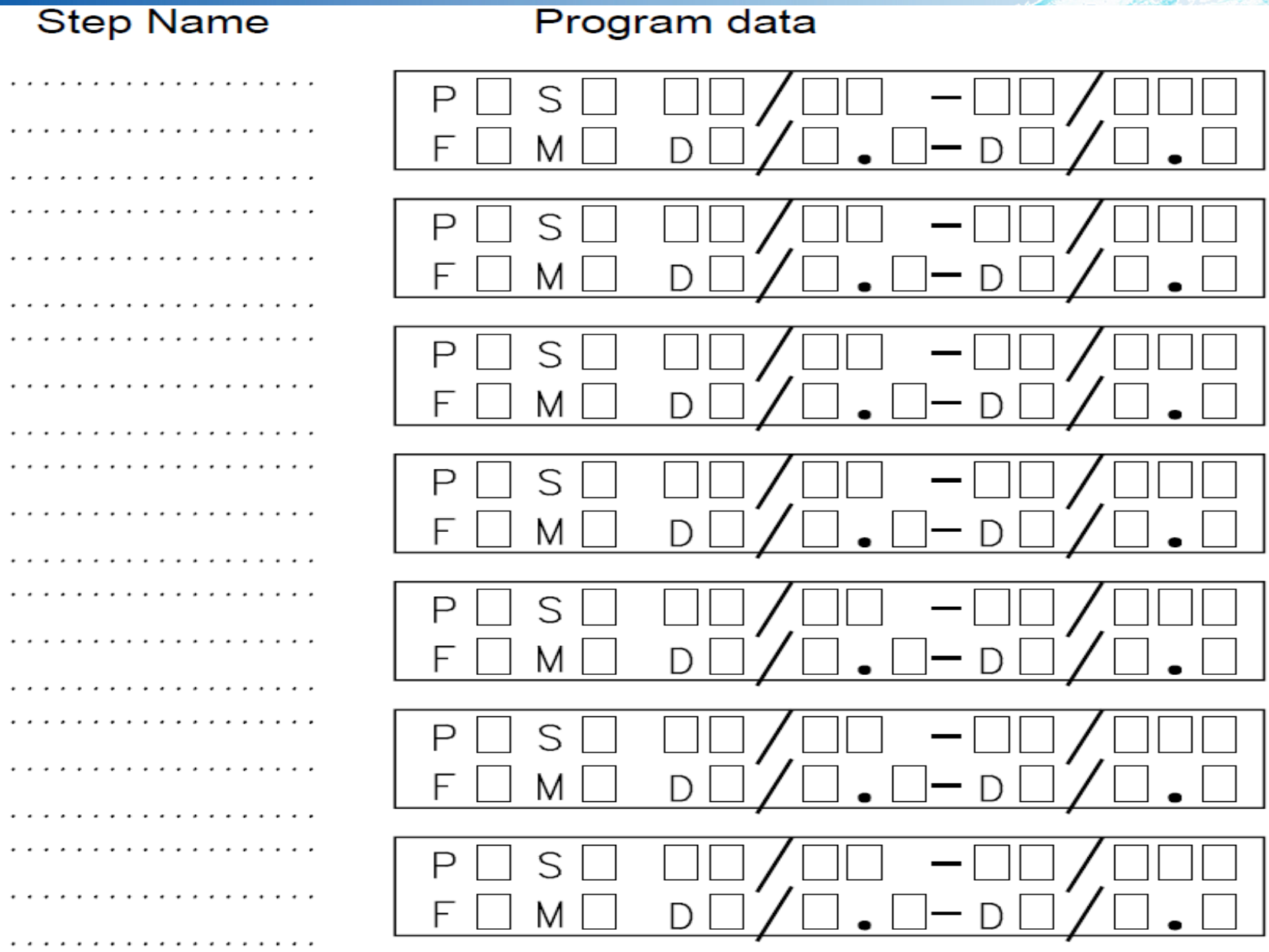


	Function F	Utility M
	F0 = Step inactive	M1 = Cold water
	F1 = Pre-rinse (M1)	M2 = Warm water
	F2 = Wash (M3)	M3 = Mixed water (cold + warm)
	F3 = Neutralise (M1, M2)	M4 = PW water
	F4 = Rinse (M1, M2)	M5 = Drying (air)
	F5 = Condense (M6, MC)	M6 = Drying, condensing exhaust air
	F6 = Chemical disinfection (M4, M9)	M7 = Heat exchange
	F7 = Thermal disinfection (M4, M9)	M8 = Disinfected PW water (tank 55℃)
	F8 = Dry (M5, MB)	M9 = Preheated PW Water (tank 90 ℃)
	F9 = Clean rinse (M4), conductivity system	MA = Previous utility
O	FA = Thermal Disinfection A_0 3000 (M4, M9)	MB = Controlled air volume flow
	FB = Thermal Disinfection A_0 600 (M4, M9)	MC = Condense non-vented
	FC = Thermal Disinfection A_0 60 (M4, M9)	
O	FD = Final rinse (M4, M8, M9)	
	FE = Second final rinse (M2, M4)	
	FF = Measuring rinse F (M8)	
O	FG = Thermal Disinfection A_0 3000 (M4, M9)	
	FH = Thermal Disinfection A_0 600 (M4, M9)	
O	FI = Thermal Disinfection A_0 60 (M4, M9)	
	FJ = Interval rinse (M8)	
●	FK = Measuring rinse K (M8)	
	FL = Measuring rinse L (M8)	



Belimed
Infection Control

Program Structure



Configuration

1. Analysis
2. Dosing
3. Controls
4. Parameter
5. Configuration
6. Limits

With this mode you can change the setup parameters of the machine.

- Temperature units
- Date/Time
- Operating hours of air filter
- Defining door position (potentiometer values) (250/290)

Belimed
Infection Control

Limits

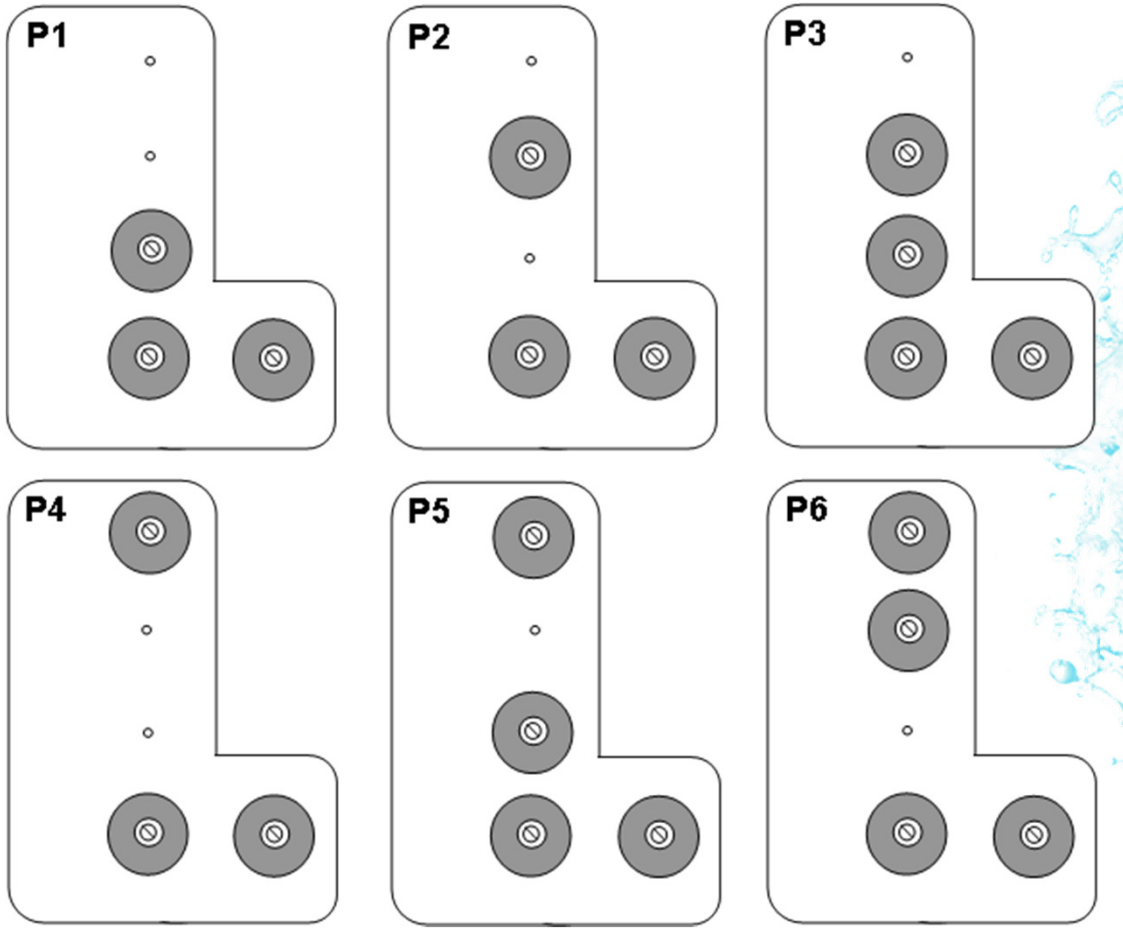
1. Analysis
2. Dosing
3. Controls
4. Parameter
5. Configuration
6. Limits

Alteration of limit values.

- Cold water fill
- Hot water fill
- DI fill
- Drain

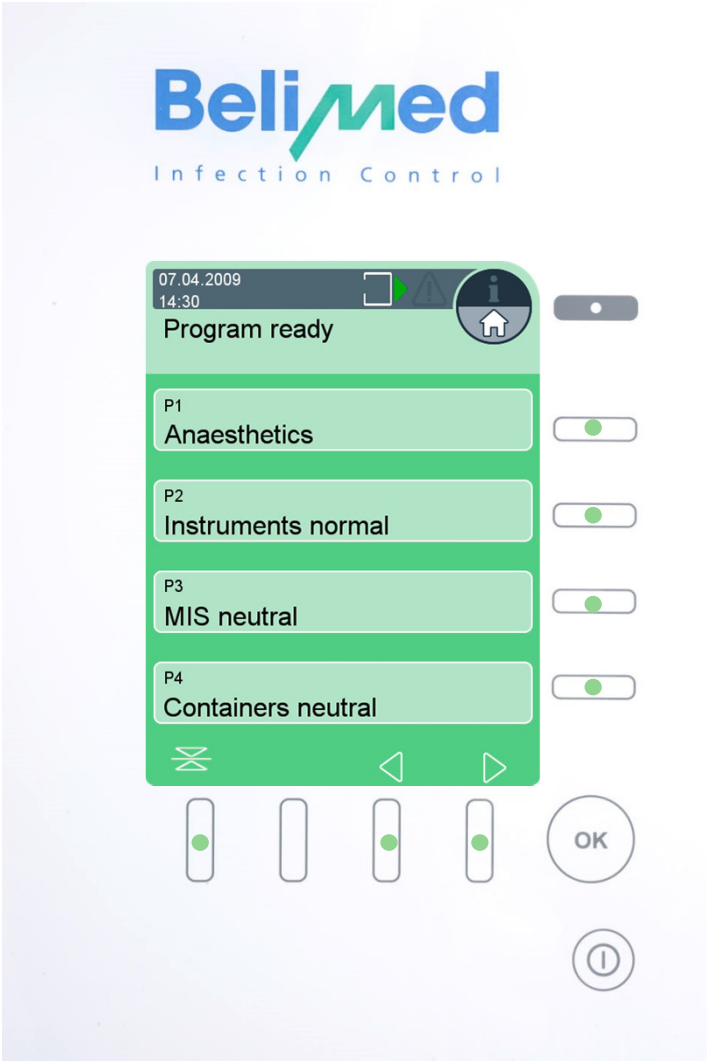
Infection Control

WD-250 magnet template



Belimed
Infection Control

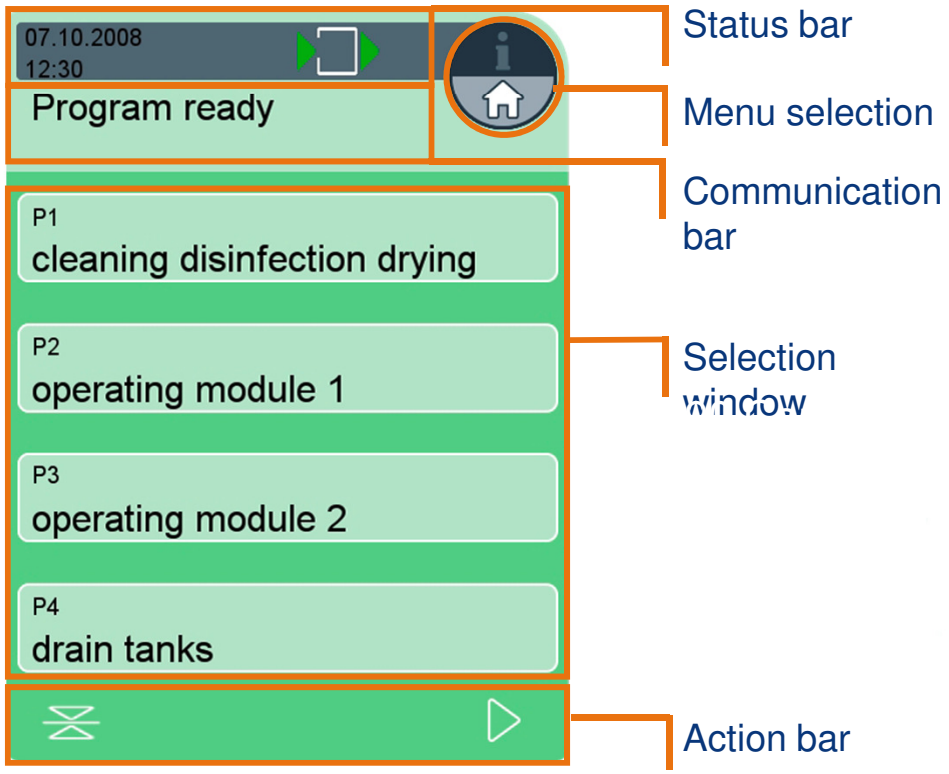
WD-290 controls



- Login and user administration
- Door functions
- Automatic program selection via rack identification
- Disinfection control with time and energy-saving A_0 value concept
- Program administration of 12

Belimed
Infection Control

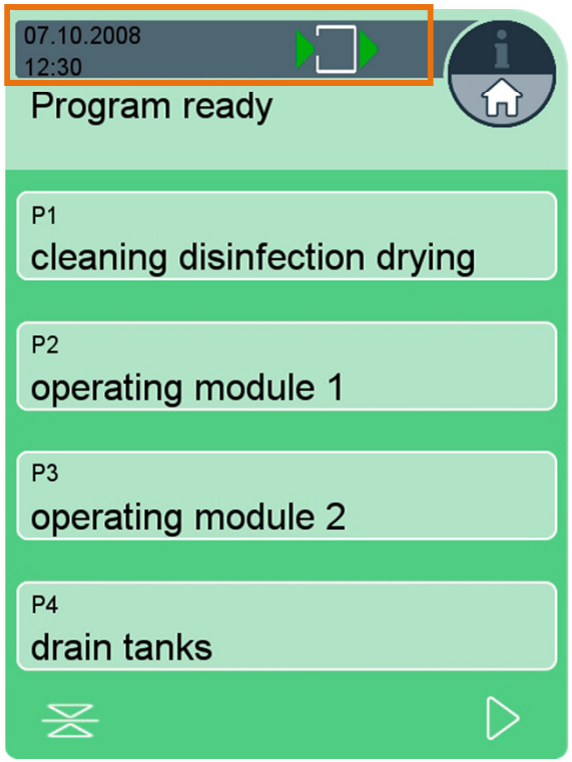
WD-290 controls



- **Status**
  General information, incl. time and date, error messages, transport unit status etc.
- **Menu selection**
  Switching between info menu and main menu. The respective active menu is displayed large below.
- **Communication**
  The function selected at your current location is always displayed.
- **Selection**
  The selection is highlighted. Start the action with the confirm button
- **Action**
  Various actions are offered here: Scroll, Return, Delete etc.

Belimed
Infection Control

WD-290 controls

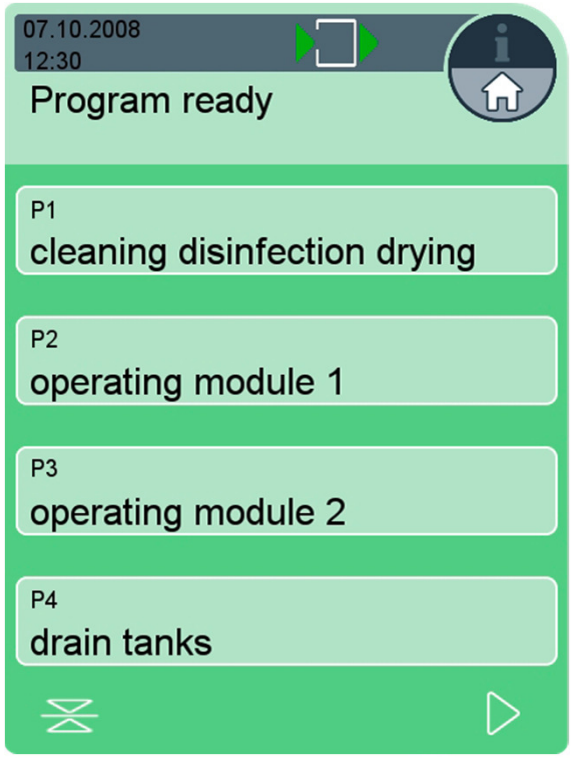


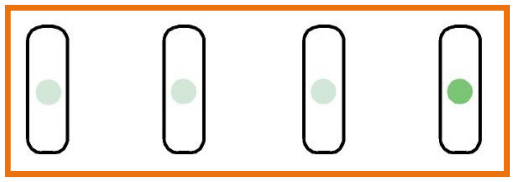
Status
General information, incl. time and date, error messages, transport unit status etc.

Symbol	Description	Symbol	Description
	Message inactive		Warning active
	Error active		Doors locked
	Doors open		Doors closed
	Door on loading side open		Door on unloading side open
	Automatic system active		Automatic system inactive
	Automatic system error		

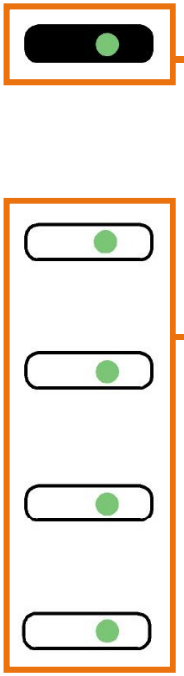
Belimed
Infection Control

WD-290 controls





Action buttons



Menu button:
Main menu
Information menu

Selection buttons

Confirm button

- Button blocks:
  - Menu
  - Selection
  - Action
  - Confirmation
- Each button that is active and can be pressed is displayed with a lit LED.
- Non-lit buttons cannot be pressed.
- Acoustic confirmation of the button press

Belimed
Infection Control

WD-290 controls clean side

Presentation in display:

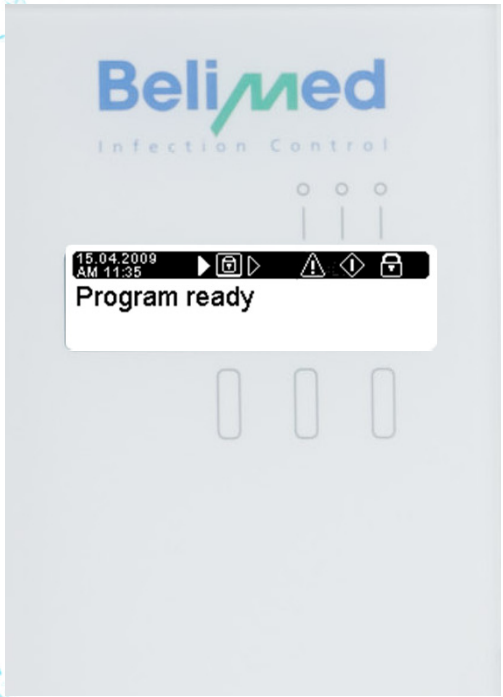
- Date/time
- Cleaning program
- Position in cleaning cycle
- Current program step
- Error messages

LED:

- Run
- Error

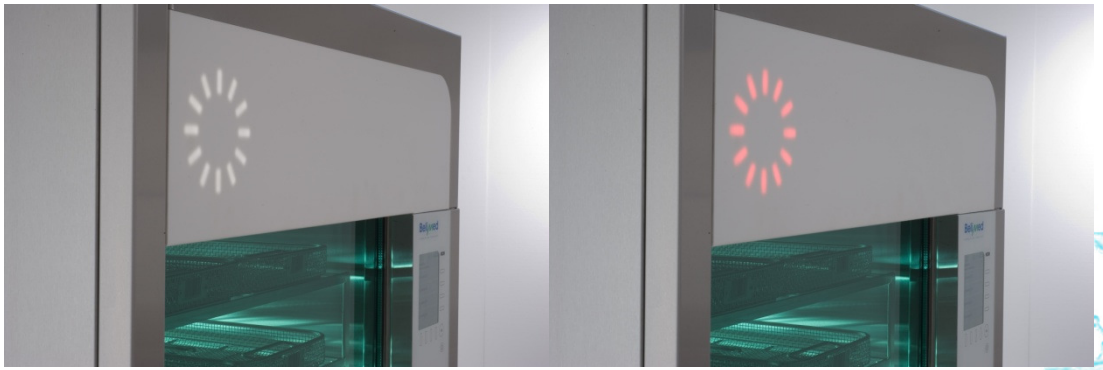
Button:

- Open door / Close door



Belimed
Infection Control

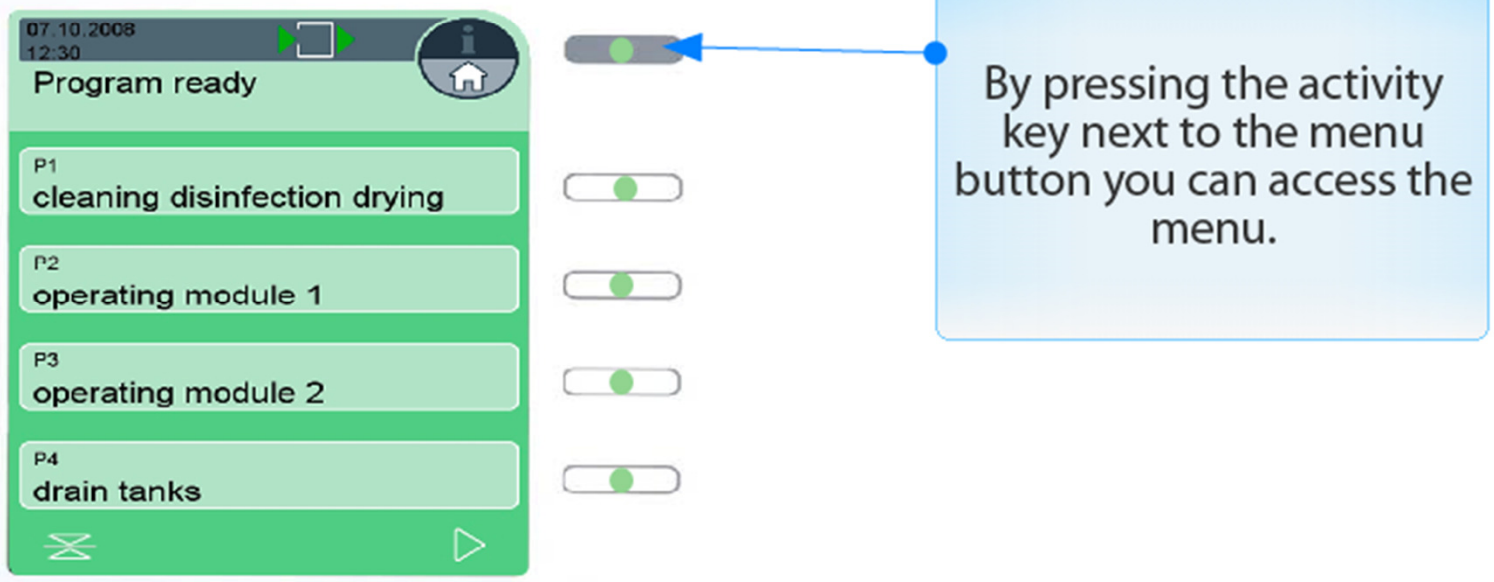
Process status display



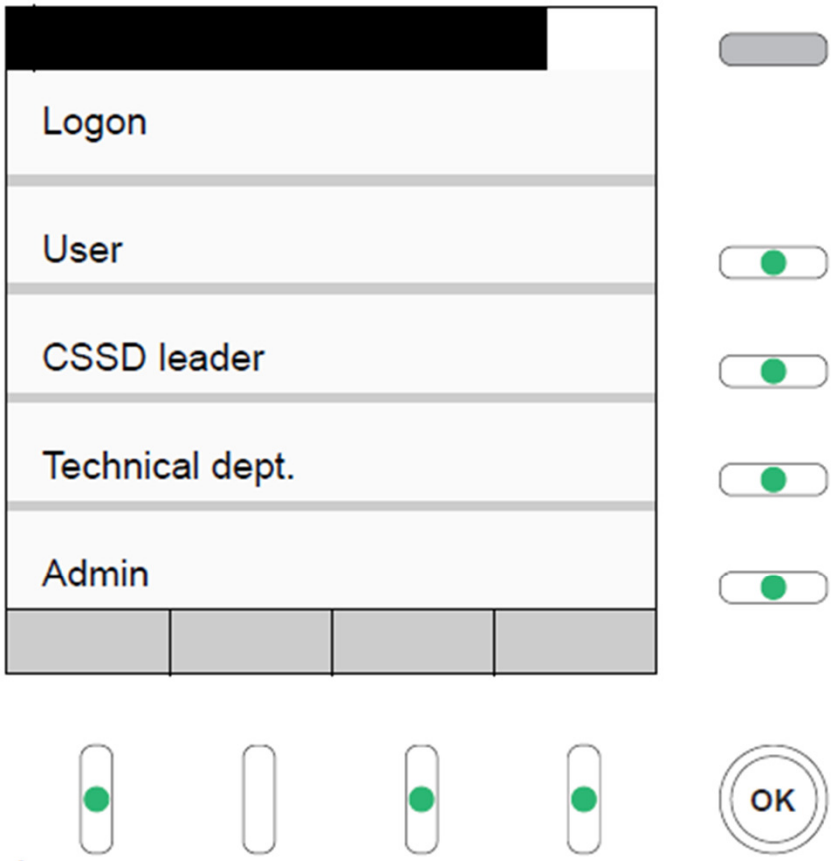
Status	LED bar display	Colour of bar
Starting position	No display	-
Programme started, remaining run time >60 min	1 bar rotates clockwise	white
Programme started, remaining run time <60 min	An additional bar lights up every five minutes until the complete status display is lit up, indicating that the programme is finished.	white
Programme finished, ready for unloading	All 12 bars flash.	white
Programme finished, unloading mode (loading-/unloading-station option)	All 12 bars light up permanently.	white
Error signal	All 12 bars flash.	red

Belimed
Infection Control

Menu


07.10.2008
12:30
Program ready
P1
cleaning disinfection drying
P2
operating module 1
P3
operating module 2
P4
drain tanks
By pressing the activity key next to the menu button you can access the menu.

Log on

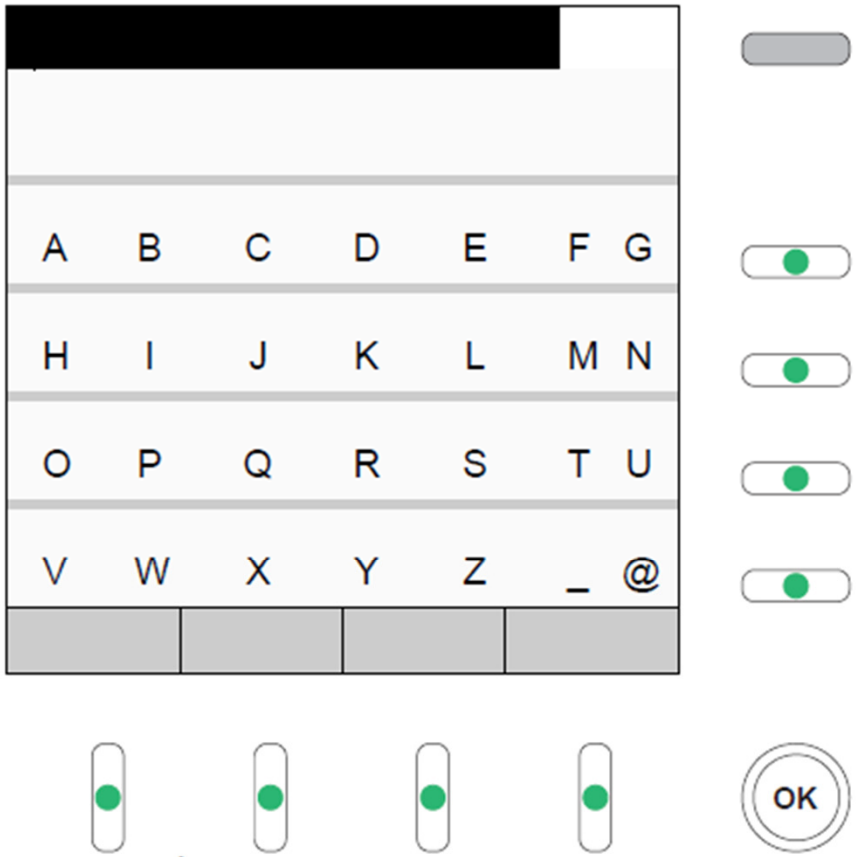


Select the desired user level.
BUS is typically on the second page.

Menus available are based on the user level.

Belimed
Infection Control

Password entry



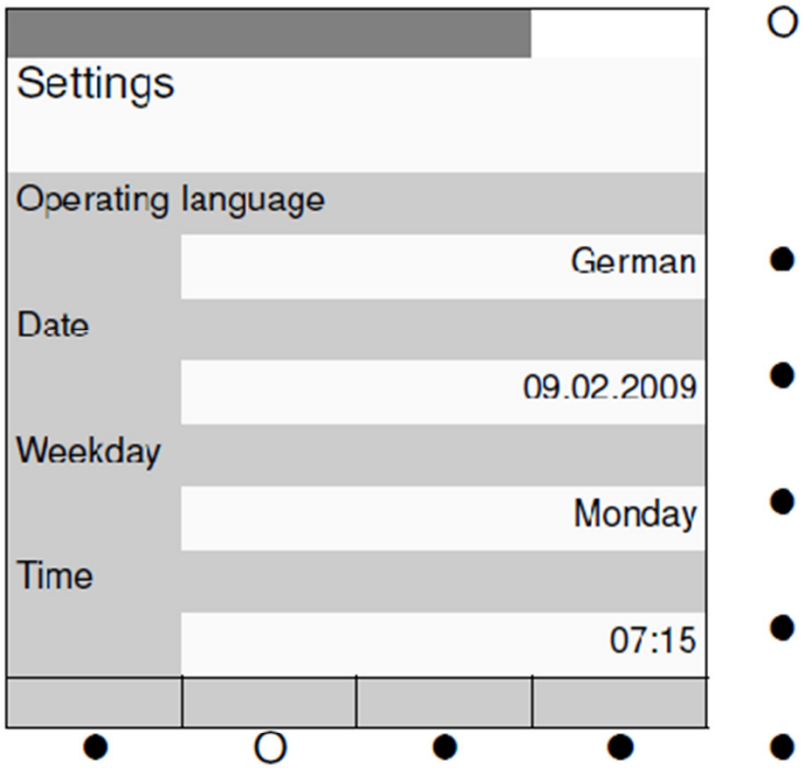
- Enter password
  - Press selection button until the desired letter is highlighted.
  - Press the → -button to move the cursor one position forward.

To change screens, press activity button ABC > abc > 123 .

Belimed Infection Control

Data entry example

Example - Setting the date:



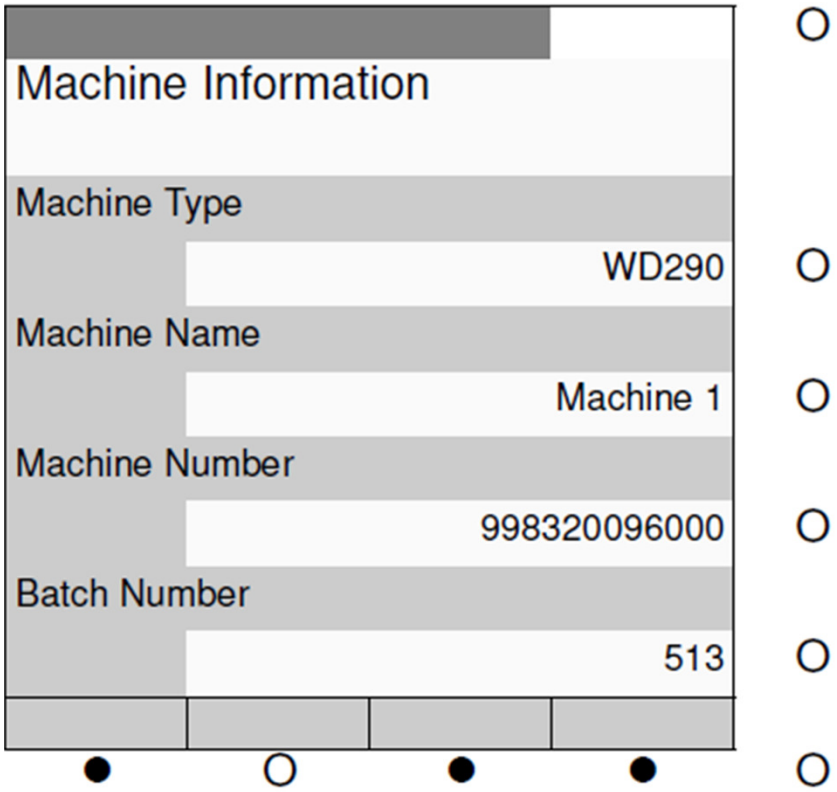
Working with the CP-TOP panel is easy once you are familiar with the logic.

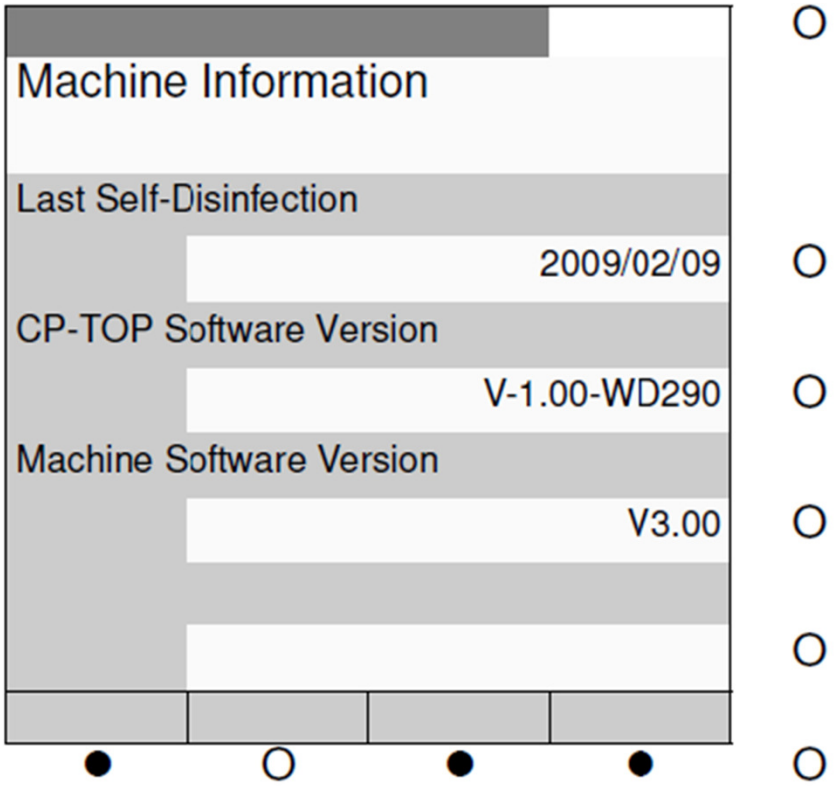
- Select date display

  The current cursor position is lighted up
- Select value to be modified using the activity button →
- Increase value using activity button + , or decrease with −
- After setting all values, confirm settings with <OK> -Button

Belimed Infection Control

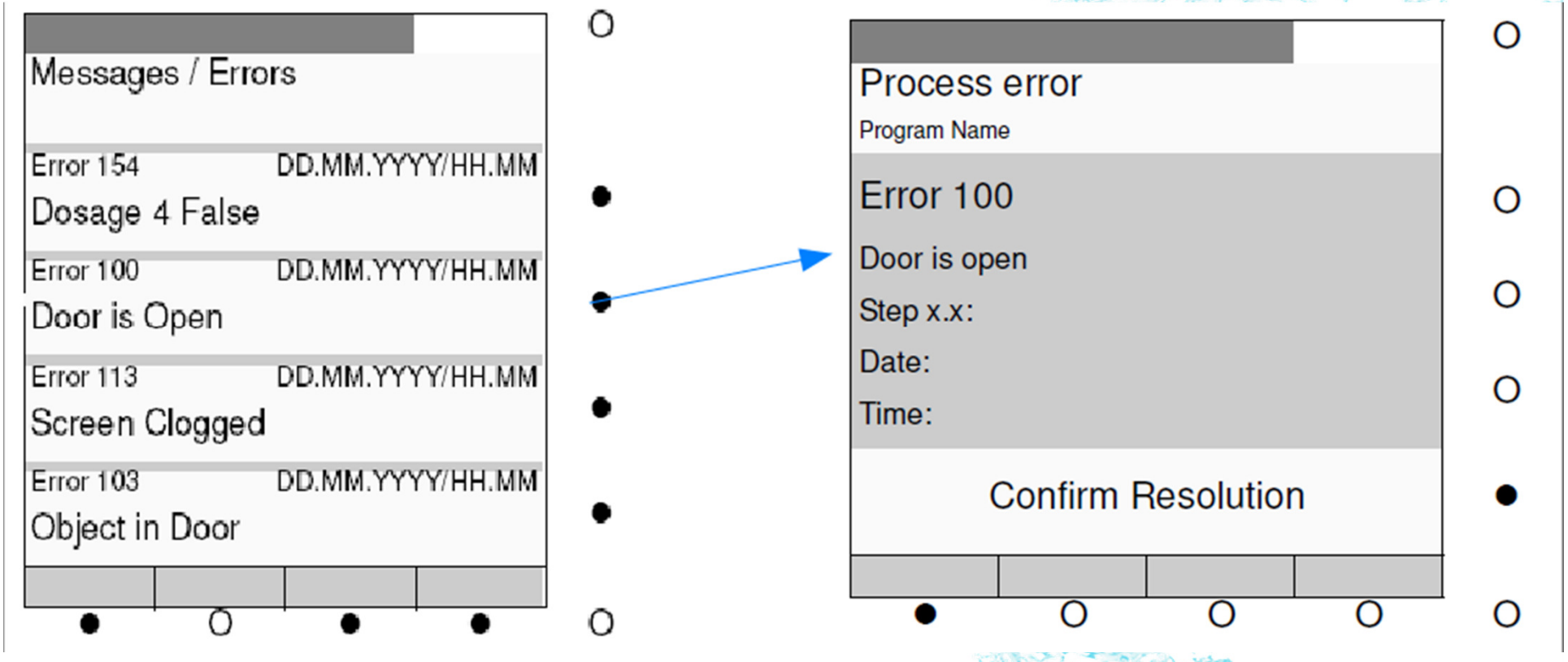
Machine information





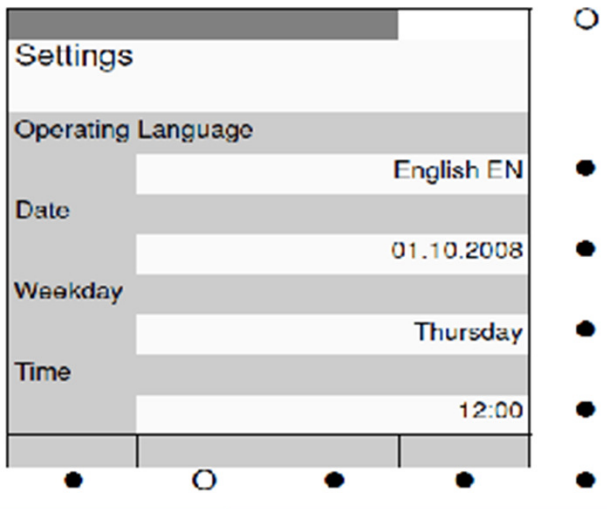
Belimed
Infection Control

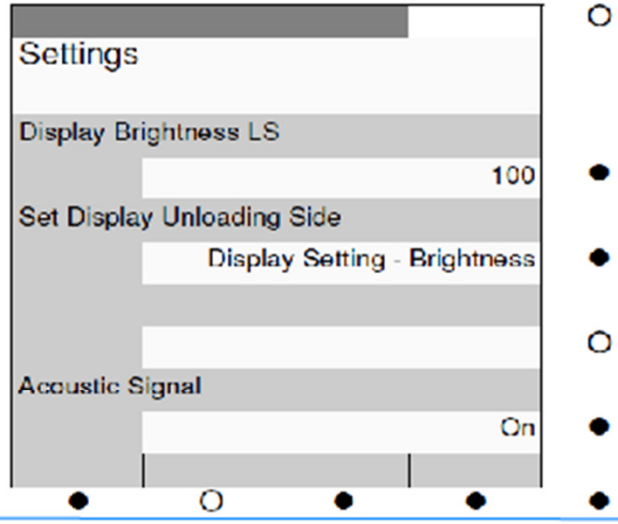
Error messages

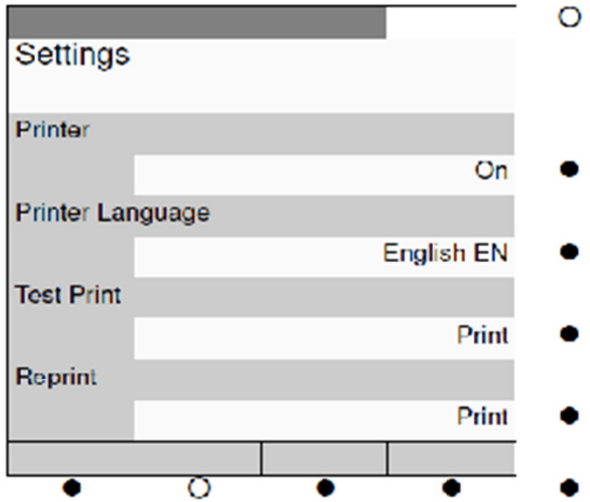


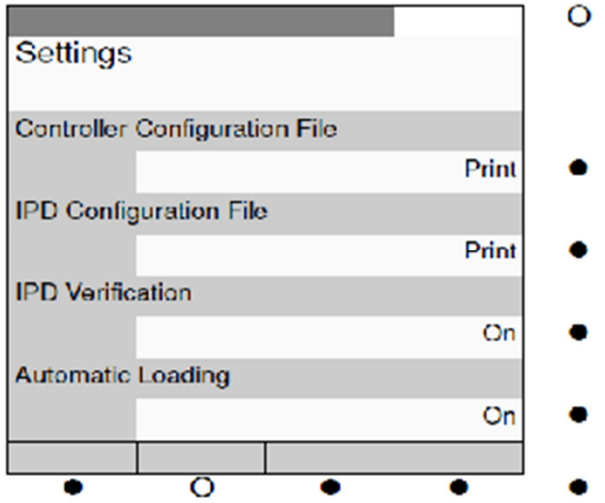
Infection Control

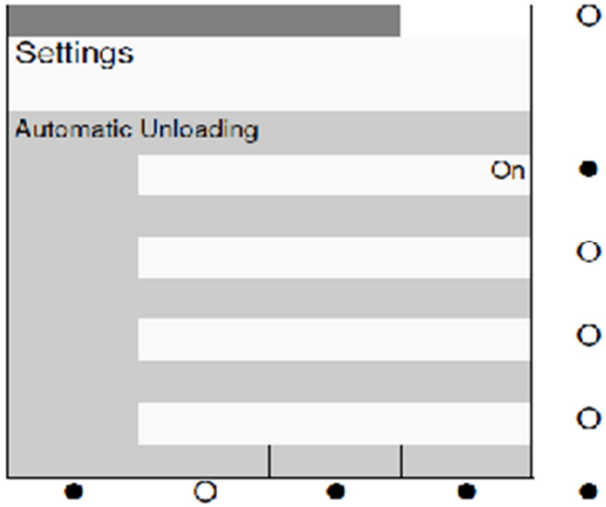
Settings





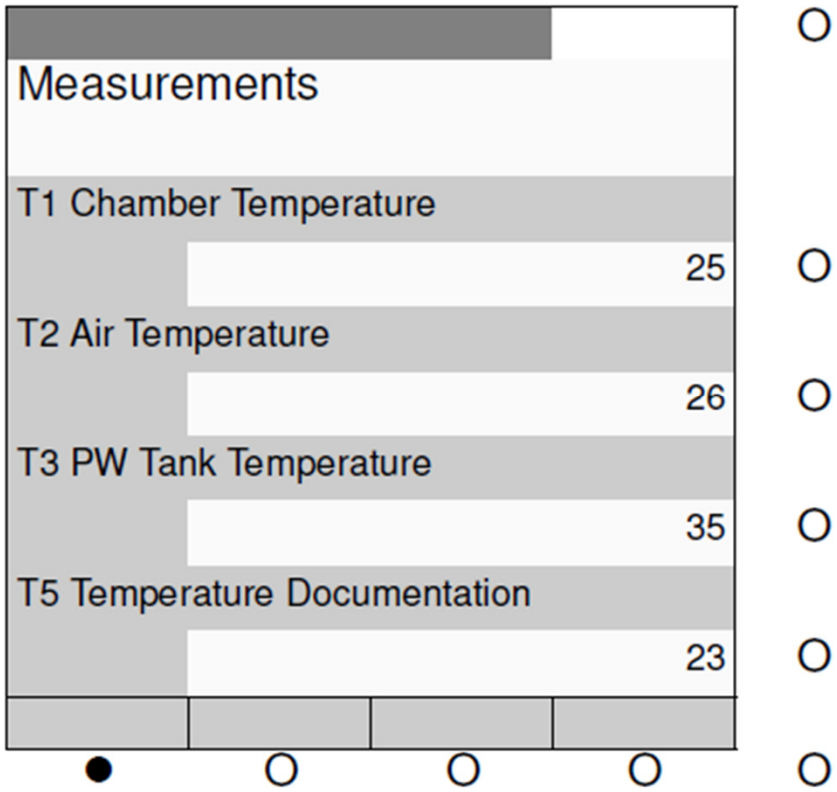






Belimed
Infection Control

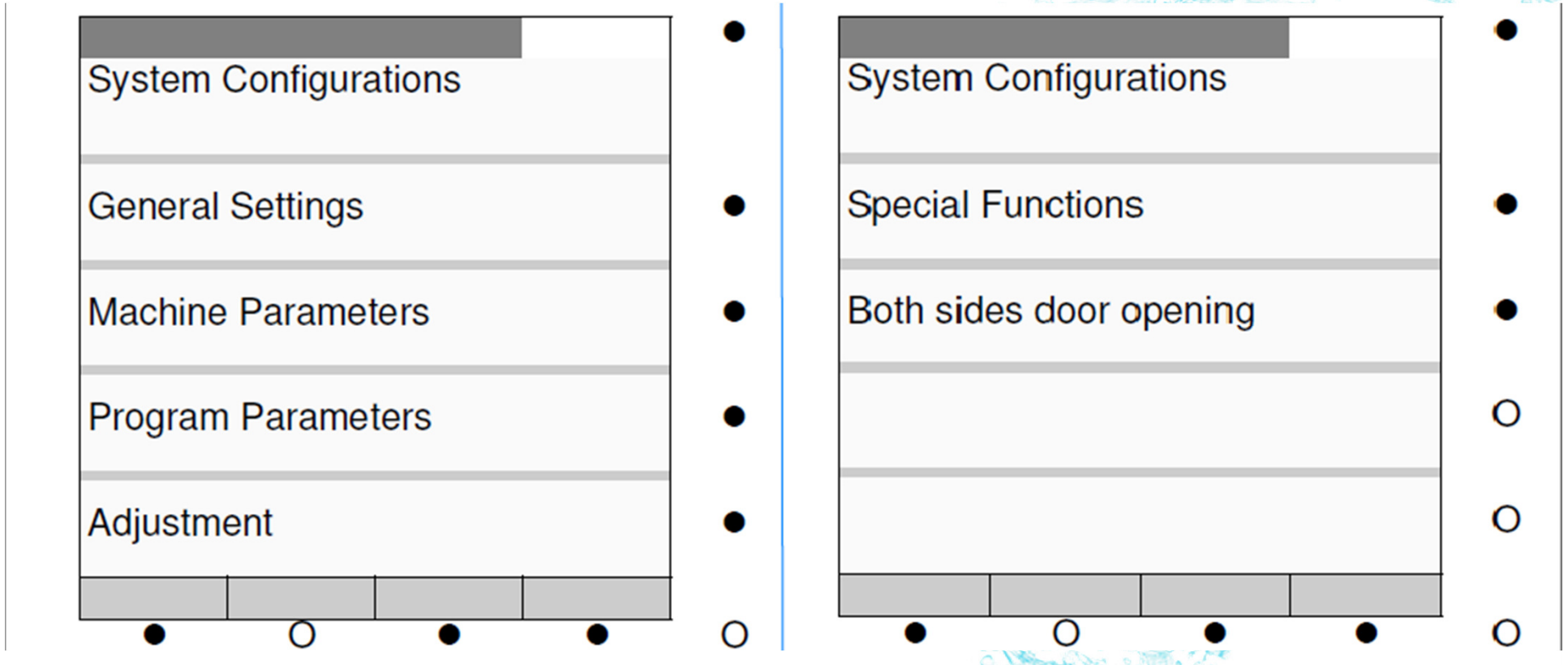
Measurements



Measurements can be seen while the unit is in normal operation.

Belimed Infection Control

System configuration



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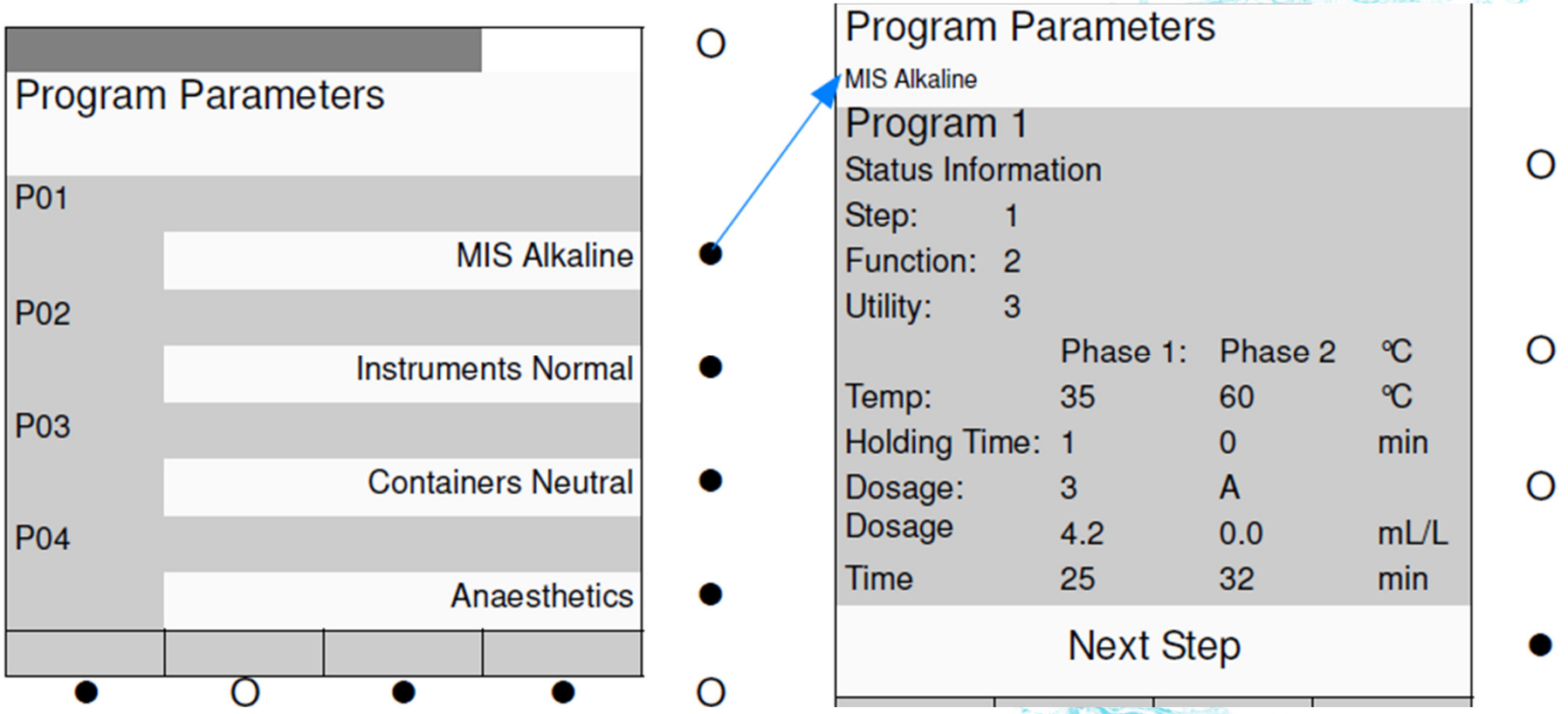
Parameters



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Function & medium

Function F	Utility M
F0 = Step Inactive	M1 = Cold water
F1 = Pre Rinse (M1)	M2 = Warm water
F2 = Wash (M3)	M3 = Mixed water (warm+cold)
F3 = Neutralise (M1, M2)	M4 = Purified water (fully de-ionised)
F4 = Rinse (M1, M2)	M5 = Drying (air)
~~F5 = Condense (M6)~~	~~M6 = Drying, Exhaust Air Condensing~~
~~F6 = Chemical Disinfection (M4, M9)~~	~~M8 = Disinfected purified water (tank 55 °C, only for endoscopy)~~
F7 = Thermal Disinfection (M4, M9)	~~M9 = Pre-heated purified water (tank 95 °C)~~
F8 = Drying (M5, M6)	MA = Preceding Utility
~~F9 = Clean Rinsing (M4), conductivity system~~	
FA = Thermal Disinfection A_0 3000 (M4, M9)	
FB = Thermal Disinfection A_0 600 (M4, M9)	
FC = Thermal Disinfection A_0 60 (M4, M9)	
FD = Final Rinse (M4, M8, M9)	
FE = Second Rinse (M2, M4)	
~~FF = Measuring Rinse (not available)~~	

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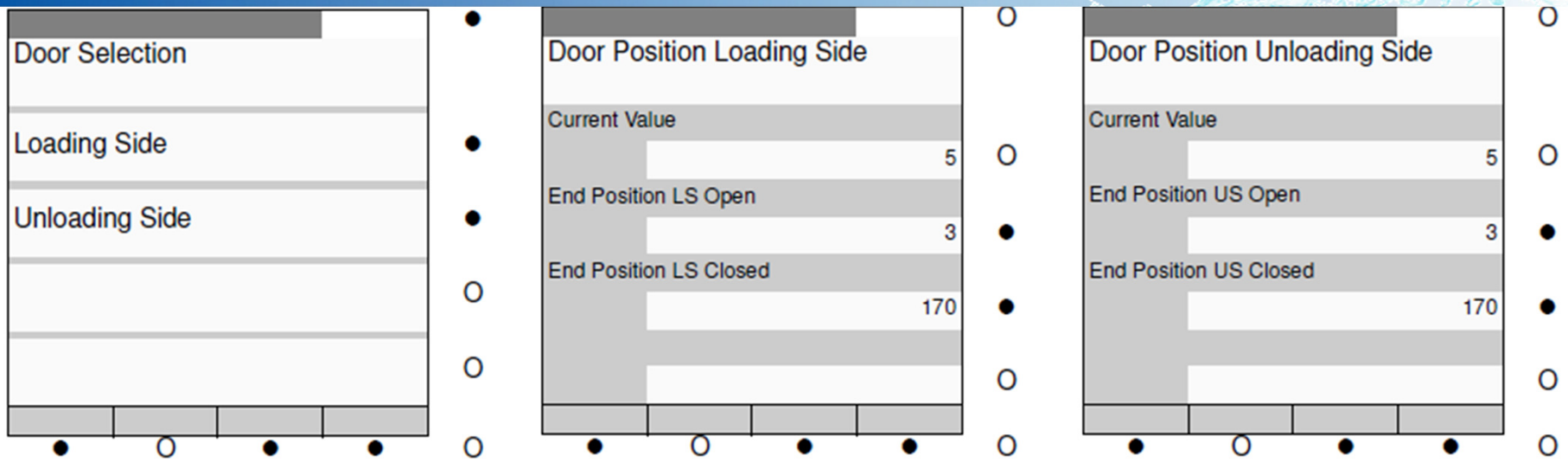
Door position



- Select function *"End Position Open"* or "*End Position Closed*"
  - The value of the current position is now displayed
- Keep Activity Button ◁▷ or ▷◁ pressed until the door has reached the end position.
- Save value using <OK> -Button

Potentiometer value range:

Linear motor extended = 0

Linear motor retracted = 255

Fig 142

Range defined as Open = 0-32 / Range defined as Closed = 153-255

The displayed value is defined by the saved value +/- 30 units; for this reason, 30 units are always +/- from the saved value.

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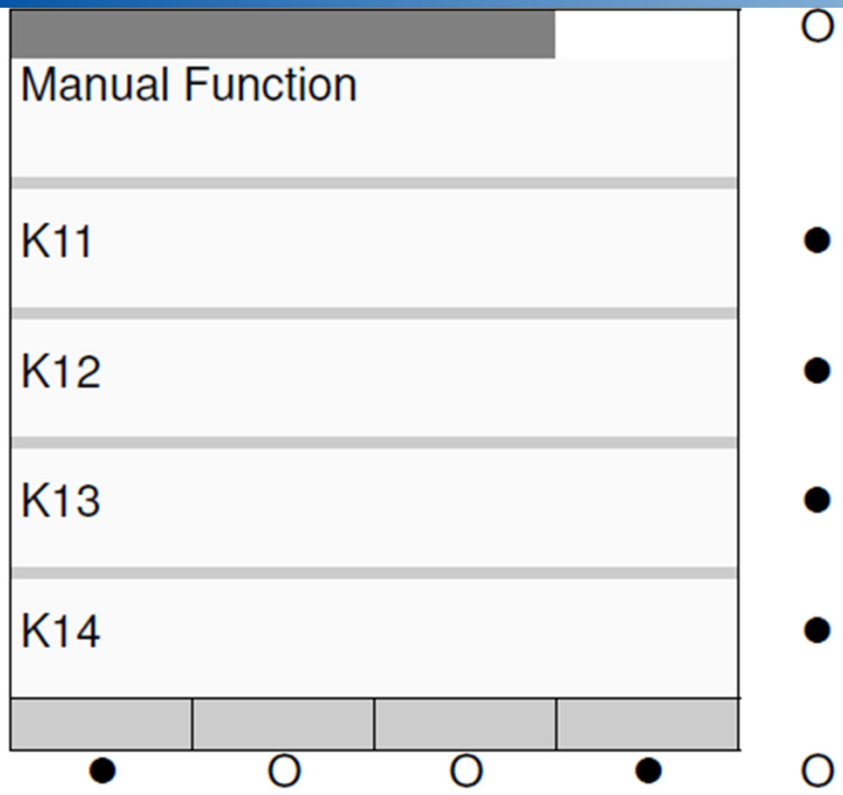
Manual function



	Output	Description
X17	Y11	CW Valve
	Y12	WW Valve
	Y13	PW Valve
	K14	PW tank drainage (optional)
	K15	Circulation pump
	K16	Tank heating
	K17	Dryer fan
	K18	Dryer heating
X18	M21	Dosing Pump 1
	M22	Dosing Pump 2
	M23	Dosing Pump 3
	M24	Dosing Pump 4
	M25	Dosing Pump 5
	K26	PW tank heating
	Y27	CW Valve (PW) for condenser
	K28	Signal for End, Run, Error, Exhaust flap, Drain cooling function, Pre switch-off function
X19	Y/M31	Drainage valve / Drainage pump
X20	K32	Washing chamber lighting
X21	K33	Rack drive inside the device
X22	Y/K34	Steam / electricity switch-over for tank heating
X23	K35	Hoist motor for opening LS
X24	K36	Hoist motor for closing LS
X25	K37	Hoist motor for opening US
X26	K38	Hoist motor for closing US
X53	M41	LS Linear motor
X54	M42	US Linear motor
X63	K57	Additional PCB with Acoustic signal, Run, Error, Exhaust flap, Drain cooling function
	K58	Additional PCB with Acoustic signal, Run, Error, Exhaust flap, Drain cooling function

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Magnet positions

Program No.	S105 (T)	S101 (A)	S102 (B)	S103 (C)	S106 (D)	S107 (E)
P1	T	A				
P2	T	A	B			
P3	T			C		
P4	T	A		C		
P5	T	A	B	C		
P6	T	A			D	
P7	T			C	D	
P8	T					E
P9	T	A				E
P10	T		B			E
P11	T	A	B			E
P12	T			C		E

Fig 186

Arrangement of the sensors

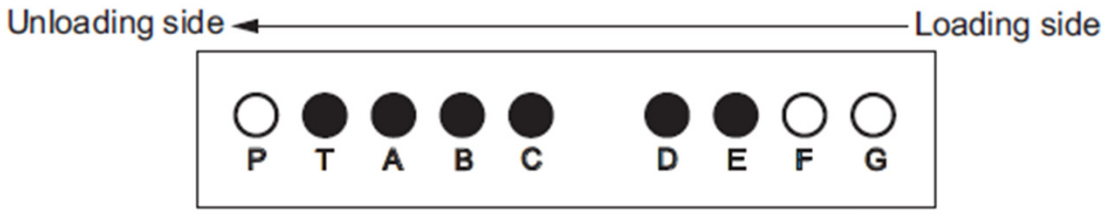

Fig 501

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Fault codes - troubleshooting

Common Utility Faults

- 141 No cold water
- 142 No hot water
- 143 No pure water
- 161 No heat in sump

Common User Faults

- 102 Door fault
- 103/108 Object blocking door
- 113 Screen clog
- 118 Program recognition
- 195/196 Emergency stop

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Error No.	Description	Error / Cause / Remedy	digital signals (S)	WD250: Alarm resolution
100	Door is Open	Switch (S1), relay (K1) or LS potentiometer value (R1) is not within range or has gone out of range while program was running. Input (S110), (R1) is monitored only while program is running.	S110	
101	Door does not open	If the opening process with LS motor (M35) takes longer than 16 s until the switch (S112) opens or the potentiometer value (R1) is closed, the controller terminates the process with error display. Input (S112), (R1) is monitored during the opening process.	S112	**Door drive | Door belts:** US: M35 & REL35 open & REL36 close CS: M37 & REL37 open & REL38 close ***Motor doesn't drive:*** Door drive belts intact? Replace belts. ***Contactor activates:*** Check 3Ø voltage contactor, Check fuses F11, F12, Check door motor capacitor. ***Contactor doesn't activate:*** Check 24Vac, Replace contactor, ***Check output LED's on Control PCB*** : Check wiring, Replace Control PCB, ***Motor drives:*** Check upper/lower limit switches. Check wiring.
102	Door does not close	If the closure process with LS motor (M35) takes longer than 16 s until the upper switch (S1/K1) closes or the potentiometer value (R1) is closed, the controller terminates the process with error display. Input (S110), (R1) is monitored during the closure.	S110	**Door drive | Door belts:** US: M35 & REL35 open & REL36 close CS: M37 & REL37 open & REL38 close ***Motor doesn't drive:*** Door drive belts intact? Replace belts. ***Contactor activates:*** Check 3Ø voltage contactor, Check fuses F11, F12, Check door motor capacitor. ***Contactor doesn't activate:*** Check 24Vac, Replace contactor, ***Check output LED's on Control PCB*** : Check wiring, Replace Control PCB, ***Motor drives:*** Check upper/lower limit switches. Check wiring.

103	Object in Door	LS Safety switch actuator (S209) has been triggered. If during the closure process the safety switch actuator opens Relay ESR1, the controller terminates the closure process with error display and reopens the door (M35). Input (S209) is monitored only during the closure process.	S209	**Door tape safety switch** DS: ESR-1 & K1 CS: ESR-2 & K2 **Obstruction in door track:** Clear obstruction. **Check Tape Switch Relay PCB:** Red LED: tape switch disconnected, check wiring/plug, replace tape switch. Yellow LED: tape switch tripped: No obstruction, replace switch. Green LED: tape switch normal.
105	Door is Open	Switch (S2), relay (K2) or US potentiometer value (R2) is not within range or has gone out of range while program was running. Input (S111), (R2) is monitored only while program is running. Cause and remedy see Error 100	S111	
106	Door does not open	If the opening process with US motor (M38) takes longer than 16 s until the switch (S113) cpens or the potentiometer value (R2) is closed, the controller terminates the process with error display. Input (S113), (R2) is monitored during the closure.	S113	**Door drive | Door belts:** US: M35 & REL35 open & REL36 close CS: M37 & REL37 open & REL38 close ***Motor doesn't drive:*** Door drive belts intact? Replace belts. ***Contactor activates:*** Check 3Ø voltage contactor, Check fuses F11, F12, Check door motor capacitor. ***Contactor doesn't activate:*** Check 24Vac, Replace contactor, ***Check output LED's on Control PCB*** : Check wiring, Replace Control PCB, ***Motor drives:*** Check upper/lower limit switches. Check wiring.

107	Door does not close	If the closure process with US motor (M38) takes longer than 16 s until the upper switch (S2/K2) closes or the potentiometer value (R2) is closed, the controller terminates the process with error display. Input (S111), (R2) is monitored during the closure.	S111	**Door drive | Door belts:** US: M35 & REL35 open & REL36 close CS: M37 & REL37 open & REL38 close ***Motor doesn't drive:*** Door drive belts intact? Replace belts. ***Contactor activates:*** Check 3Ø voltage contactor, Check fuses F11, F12, Check door motor capacitor. ***Contactor doesn't activate:*** Check 24Vac, Replace contactor, ***Check output LED's on Control PCB*** : Check wiring, Replace Control PCB, ***Motor drives:*** Check upper/lower limit switches. Check wiring.
108	Object in Door	US Safety switch actuator (S210) has been triggered. If during the closure process the safety switch actuator opens Relay ESR1, the controller terminates the closure process with error display and reopens the door (M38). Input (S210) is monitored only during the closure process.	S210	**Door tape safety switch** DS: ESR-1 & K1 CS: ESR-2 & K2 **Obstruction in door track:** Clear obstruction. **Check Tape Switch Relay PCB:** Red LED: tape switch disconnected, check wiring/plug, replace tape switch. Yellow LED: tape switch tripped: No obstruction, replace switch. Green LED: tape switch normal.
109	No Communication	Communication between processor and door panel PCB (IPD) has been disrupted.		
110	No Pressure	Pressure in washing system has dropped below minimum. If Switch (S211) is still open during the program 90 s after the filling phase, the controller terminates the current program with error display. Input (S211) is monitored only with Utilities (M1-M4), (M7-M9), 90 s after the program time and below 85°C. Monitoring is inactive above 85°C.	S211	**Pressure Switch S211:** Wash pump circulates water. Level sensor ok: Check for activation of S211. Replace switch.

112	System Leakage	Leakage in the device. If Switch (SB) in the floor pan closes for longer than 2 s, the controller terminates the current program with error display. Input (SB) is monitored in "Program Ready" -Mode as well.	SB	
113	Screen Clogged	If Switch (S109) opens for more than 4 s with 35 mm water column, the controller terminates the current program with error display. Input for Switch (S109) is monitored during Function (F1) in the program cycle with water (M1-M4), (M7) and (M9), and also in "Program Ready" -Mode	S109	
114	Tank Disinfection	Re-cooling of the disinfected final rinse water is not possible. Failure to reach the target temperature of the final rinse water. The input "DI tank code SC" is open in Program Step M7. Program Step M7 is missing in Program Step M8.	SC, K55	
118	Program Recognition	When automatic program recognition is activated, the switches are checked for function. If one of the switches (S101-S103) and (S106- S108) will not close, an error is displayed. When the LS door is open, all switches are monitored. When Switch (S105) has closed, Switches (S101-S103), (S106) and (S107) must have closed at least once beforehand, otherwise an error is displayed.	S101-S103,S106-S108	

121	No Water	Level sensor is defective or not connected. If the level sensor (P1) is not closed for longer than 2 s (value between 0.2V and 4.5V), the controller terminates the current program with error display. The threshold values for Input (P1) are monitored during the program cycle.		**Drain valve** Drain valve not closing. If possible, check floor drain for water flow during wash. If drain boot suspected, do not dismantle drain valve until replacement part available. Replace drain boot. **Level sensor** Faulty level sensor. Check voltage at transducer. Empty level: 0.5Vdc, Working level: minimum 1.0Vdc, dynamic reading. Replace sensor | Replace sensor board | Check wiring | Check power supply | Check input to control board | Replace control board.
130	NTC 1 Defective	The temperature sensor in the washing chamber floor is defective or not connected (value between 0°C and 150°C). The controller terminates the current program with error display.		**Drain valve** Drain valve not closing. If possible, check floor drain for water flow during wash. If drain boot suspected, do not dismantle drain valve until replacement part available. Replace drain boot. **Level sensor** Faulty level sensor. Check voltage at transducer. Empty level: 0.5Vdc, Working level: minimum 1.0Vdc, dynamic reading. Replace sensor | Replace sensor board | Check wiring | Check power supply | Check input to control board | Replace control board.
131	NTC 2 Defective	Dryer temperature sensor (NTC2) is defective or not connected. Cause and remedy see Error 130		**Temperature Sensors:** Blowers/heaters activate; no change in temperature display: Check wiring to sensors. Replace sensors. Check Control PCB. Error code 132: may indicate inadequate air flow to sensor #2 in heater compartment. Check that diffuser plate in heater compartment is aligned to upper port.
133	NTC 3 Defective	Temperature sensor (NTC3) is defective or not connected. Cause and remedy see Error 130		
134	NTC 4 Defective	PW tank temperature sensor (NTC4) is defective or not connected. Cause and remedy see Error 130		
135	NTC 5 Defective	Washing chamber floor temperature sensor (NTC5) is defective or not connected. Cause and remedy see Error 130		

136	NTC 6 Defective	PW tank temperature sensor (NTC6) is defective or not connected. Cause and remedy see Error 130		
140	No Purified Water to tank	PW tank float Switch (SD) is still open after 15 minutes while filling is in process. No purified water supply to tank.	SD	
141	No Cold Water	Failure to reach operating level with CW during the filling process. No CW supply in the washing chamber, or switch (S1, S2) open. If, in the filling process with CW (Y11), Operating Level 2 of the level sensor (P1) is not reached within 5 minutes, the controller terminates the current program with error display. Threshold monitoring: Only during the filling process until Operating Level 2 has been reached.	L1,S110,S111	**Supply and shut off valves** Check with facilities maintenance for any water outages. Verify all water supply valves are turned on. **Water valves** Water valves not opening. Activate all water valves in the service mode and verify activation/flow. Check voltage to coil & Check 24Vac power supply & Check fuses F1, F2, F9, F10 & Check wiring, connectors. **Strainers** Clogged water supply strainers. Clean. **Hoses**Check hoses for any kinks or obstructions. Melted rubber oozes out of SS braids. Hoses lying against steam hoses. Replace hose(s).
142	No Warm Water	Failure to reach operating level during the filling process. No warm water supply in the washing chamber, or switch (S1, S2) open. If, in the filling process with WW (Y12), Operating Level 2 of the level sensor (P1) is not reached within 5 minutes, the controller terminates the current program with error display Cause and remedy see Error 141.	L1,S110,S111	**Supply and shut off valves** Check with facilities maintenance for any water outages. Verify all water supply valves are turned on. **Water valves** Water valves not opening. Activate all water valves in the service mode and verify activation/flow. Check voltage to coil & Check 24Vac power supply & Check fuses F1, F2, F9, F10 & Check wiring, connectors. **Strainers** Clogged water supply strainers. Clean. **Hoses**Check hoses for any kinks or obstructions. Melted rubber oozes out of SS braids. Hoses lying against steam hoses. Replace hose(s).

143	No Purified Water	Failure to reach operating level with purified water during the filling process. If, in the filling process with purified water (Y13), Operating Level 2 of the level sensor (P1) is not reached within 7 minutes, the controller terminates the current program with error display Cause and remedy see Error 141.	K13	**Supply and shut off valves** Check with facilities maintenance for any water outages. Verify all water supply valves are turned on. **Water valves** Water valves not opening. Activate all water valves in the service mode and verify activation/flow. Check voltage to coil & Check 24Vac power supply & Check fuses F1, F2, F9, F10 & Check wiring, connectors. **Strainers** Clogged water supply strainers. Clean. **Hoses**Check hoses for any kinks or obstructions. Melted rubber oozes out of SS braids. Hoses lying against steam hoses. Replace hose(s).
146	No Purified Water from Tank	Failure to reach operating level with pre-heated purified water (M9) from the tank during the filling process. If Operating Level 2 is not reached within 3 minutes while the filling process with pre-heated purified water (Y14) is under way, the controller terminates the current program with error display. Threshold monitoring: Threshold adjustment for pre-heated DI water supply.	K14	**Supply and shut off valves** Check with facilities maintenance for any water outages. Verify all water supply valves are turned on. **Water valves** Water valves not opening. Activate all water valves in the service mode and verify activation/flow. Check voltage to coil & Check 24Vac power supply & Check fuses F1, F2, F9, F10 & Check wiring, connectors. **Strainers** Clogged water supply strainers. Clean. **Hoses**Check hoses for any kinks or obstructions. Melted rubber oozes out of SS braids. Hoses lying against steam hoses. Replace hose(s).

147	Overflow Level	The maximum overflow level has been reached. If, while the circulation pump is running, the overflow level of 2.1 V of the level sensor (P1) is exceeded for more than 5 s, the controller terminates the current process with error display. If, during a water step without active circulation pump, the static overflow level of 2.3 V of the level sensor (P1) is exceeded for more than 5 s, the controller terminates the current process with error display. Dynamic threshold = 2.1 V (with circulation pump M15). Static threshold = 2.3 V (without circulation pump M15).		**Water valves** Water valves not closing. Water flow during standby or with door open. Replace valve(s). **Level sensor** Check voltage at transducer or input to control board. Empty level: 0.5Vdc, Working level: minimum 1.0Vdc, dynamic reading or no change in reading. Check the transducer hose for the presence of water (indicates a hole/leak in the hose). Check hose for kinks or pinched areas. Replace sensor | Replace sensor board | Check wiring | Check input to control board | Check power supply | Replace control board **Overflow sensor** Sensor faulty | Obstructed hose
148	No Drainage	Empty level monitoring system detects no change of level during drainage of washing chamber. If the level does not drop to 0.7V (empty level +0.2V) within 3 minutes while drainage via drainage valve (Y31) or drainage pump is in process, the controller terminates the current process with error display. Threshold monitoring: Only during drainage until empty level has been reached, or for 5 s after start of drainage.	K31	**Drain Valve:** Drain valve doesn't open. Activate valve in the service mode and verify activation/flow. Solenoid activates: Check drain boot, replace if faulty. Check voltage to coil: Check wiring & check power supply, fuses. Check output LED on Control PCB: Replace Control PCB.

149	Level Too Low	Water level has dropped below minimum operating level during washing process. Loss of water in the washing phase. If the level drops below the minimum level of 1 Volt for 15 s in the course of the washing cycle, the controller terminates the current process with display. Threshold monitoring: Only during the heating phase.		**Drain valve** Drain valve not closing. If possible, check floor drain for water flow during wash. If drain boot suspected, do not dismantle drain valve until replacement part available. Replace drain boot. **Level sensor** Faulty level sensor. Check voltage at transducer. Empty level: 0.5Vdc, Working level: minimum 1.0Vdc, dynamic reading. Replace sensor | Replace sensor board | Check wiring | Check power supply | Check input to control board | Replace control board.
150	Level Too High	Maximum level (water above edge of door) exceeded. Unwanted entry of water into the washing chamber. If the level of 3.2V is exceeded for 3 s, the controller terminates the current process with error display. As long as the level is above 3.2V, the washing chamber doors remain locked. Threshold monitoring: As long as the device is switched on.		
151	Dosage 1 False	No dosing, or too high dosage. Flow Meter 1 does not detect required impulses.If a dosage has been programmed with Flow Meter 1 in the stepphase, at least 10 impulses of Flow Meter 1 must be counted within 1 minute during dosing with Motor (M21), and at least 50 impulses for every further 6 seconds. Otherwise the controller terminates the current process with error display.		
152	Dosage 2 False	Dosing pump, Flow Meter 2 See Error 151		
153	Dosage 3 False	Dosing pump, Flow Meter 3 See Error 151		
154	Dosage 4 False	Dosing pump, Flow Meter 4 See Error 151		

161	No Heat - Washing Chamber	Temperature sensor in the washing chamber detects no change during heating phase. If a minimum temperature change of 1°C is not detected during the heating phase in the washing chamber (NTC1) within the specified time period (3 min), or if during the holding phase the temperature is no longer reached for more than 3 minutes, the controller terminates the current process with error display. Threshold monitoring: During the heating and holding phase with water.		**No change in temperature during heating phase. - Tank sensor:** During cycle, check display for change in temperature of wash water. If steam hoses hot: Check wiring to sensor & Replace sensor & Check Control PCB **No heating. - Steam Valve:** Steam available? Pressure Open steam supply and return valves. If Steam valve doesn't open: Check wiring & Check 24Vac.
162	No Heat - PW Tank	The temperature sensor in the PW tank detects no change of temperature during the heating phase. If a minimum temperature change of 1°C is not detected during the heating phase in the PW tank (NTC4) within a specified time period (5 min), the controller terminates the current process with error display. Threshold monitoring: During the heating and holding phase Causes and remedies see Error 161.		

163	Water Too Hot	Temperature too high. Temperature 8°C higher than intended, and >45°C for pre-rinse function. Target temperature exceeded by 5°C within the washing steps (M1-4) and (M9). Termination criterion: If the target temperature of Sensor NTC1 is exceeded by 5°C during 1 minute in the course of a water step (M1-4, M9) after the filling process has been completed, the controller terminates the current process. If no temperature is entered (00 by default), the monitoring function is inactive and no error is triggered. A maximum temperature of 45°C is permitted in the cold pre-rinse function F1. If a water temperature of 45°C is exceeded, Error 163 "Water too hot" is likewise displayed and the process is terminated. Termination criterion: If "00°C" is entered for the temperature during a water step (M1-4, M9) and Function F1, and if a water temperature of 45°C, as measured by Sensor NTC1, is exceeded during one minute after the filling process has been completed, the controller terminates the current process.		
164	No Drying	The drying temperature is monitored. Unless "0°C" has been entered, a temperature of at least 80°C must be reached within 50 s after the start of the step. Safety temperature limiter (STL) was triggered (red button).		

185	No DI tank	The input "DI Tank Code, SC" is open when reaching a program step with Utility M8.	SC	
188	No Communication with I/O	No communication.		
189	No Communication with IPD	No communication (IPD).		
190	No Communication with SPI Bus	General communication problem of data connections to controllers due to voltage breakdown.		
191	Input Voltage Error	Supply voltage for ECU controller too low. (<22VAC)		With WDs - US voltage is 208VAC 3ph. BW has 4 transformers (2x 230VAC & 2x 208VAC). The 208VAC transformers are required to maintain a low voltage >22VAC - above Alarm level. Common issue with WD250s and 84000 board. Transformer should be part - 73999 (208VAC 50/60Hz - 24V 150VA)
192	SC Test Error	The deviation of the current measurement result from calibration characteristics exceeds the specified tolerance limit.		
193	No Communication with RFID	There is a communication problem with the RFID (Radio Frequency Identification) -PCB.		
194	No Transponder Reception	Failure to read transponder.		
195	Emergency stop - Loading side	Activating the Emergency Stop immediately interrupts the process.	S207	
196	Emergency stop - Unloading side	Activating the Emergency Stop immediately interrupts the process.	S208	
300	Wash arm top 1	Wash arm 1 (Top) is jammed	WAS1L,WAS1R	

301	Rack wash arm 2	Rack wash arm 2 is jammed	WAS2L-WAS10L,	
302	Rack wash arm 3	Rack wash arm 3 is jammed	WAS2L-WAS10L,	
303	Rack wash arm 4	Rack wash arm 4 is jammed	WAS2L-WAS10L,	
304	Rack wash arm 5	Rack wash arm 5 is jammed	WAS2L-WAS10L,	
305	Rack wash arm 6	Rack wash arm 6 is jammed	WAS2L-WAS10L,	
306	Rack wash arm 7	Rack wash arm 7 is jammed	WAS2L-WAS10L,	
307	Wash arm bottom 8	Wash arm 8 (bottom) is jammed	WAS11	

PM check sheet

Washer Maintenance Inspection Form

Customer:_____Date _____

Model#: _____Serial#:_____

	Maintenance Visits 1st.	2nd.	3rd.
Check HEPA & pre-filter. (Replace annually)	[ ]	[ ]	[ ]
Check blower performance.	[ ]	[ ]	[ ]
Check heating element performance. Verify drying time/temperature.	[ ]	[ ]	[ ]
Inspect 2" check valve.	[ ]	[ ]	[ ]
Test water tank heating time.	[ ]	[ ]	[ ]
Inspect exhaust/heater hose condition.	[ ]	[ ]	[ ]
Inspect DS/CS door pistons, linkage, hardware. (SM1000)	[ ]	[ ]	[ ]
Check pneumatic manifold, valve operation. (SM1000)	[ ]	[ ]	[ ]
Inspect DS/CS door handle, springs, hardware. (All manual doors)	[ ]	[ ]	[ ]
Check DS/CS door limit switches.	[ ]	[ ]	[ ]
Check DS/CS door motor operation. (All auto doors)	[ ]	[ ]	[ ]
Inspect DS/CS door gasket condition.	[ ]	[ ]	[ ]
Inspect DS/CS door belts.	[ ]	[ ]	[ ]
Check DS/CS linear door motor operation.	[ ]	[ ]	[ ]
Inspect DS/CS linear door motor linkage, connections, wiring.	[ ]	[ ]	[ ]
Clean and inspect upper/lower wash arms.	[ ]	[ ]	[ ]
Verify control/panel print software dates/codes.	[ ]	[ ]	[ ]
Check electrical connections, plugs, wires.	[ ]	[ ]	[ ]
Check high voltage contactors, relays, breakers. (Tighten all connections)	[ ]	[ ]	[ ]
Inspect DS/CS foils.	[ ]	[ ]	[ ]
Verify pressure transducer readings.	[ ]	[ ]	[ ]
Check compressed air supply pressure, moisture.	[ ]	[ ]	[ ]
Inspect air hoses for leaks.	[ ]	[ ]	[ ]
Check large water pump operation, impeller condition.	[ ]	[ ]	[ ]
Check small water pump operation, impeller condition. (SM1000)	[ ]	[ ]	[ ]
Inspect condition of all hoses, piping, fittings.	[ ]	[ ]	[ ]
Inspect condition of CW, HW, DI water hoses, connections, strainers.	[ ]	[ ]	[ ]
Perform water quality checks.	[ ]	[ ]	[ ]
Test wash/neutralizer pH.	[ ]	[ ]	[ ]
Verify fill time. (All water supplies)	[ ]	[ ]	[ ]
Check operation of metering pumps.	[ ]	[ ]	[ ]
Inspect chemical hoses, clamps, check valves.	[ ]	[ ]	[ ]
Inspect steam hoses, connections, strainers.	[ ]	[ ]	[ ]
Verify steam trap or drip leg performance.	[ ]	[ ]	[ ]
Check steam valve operation.	[ ]	[ ]	[ ]
Inspect exhaust duct for tears/leaks, damper position.	[ ]	[ ]	[ ]
Check drain valve operation, piping for leaks. Verify drain time.	[ ]	[ ]	[ ]
Record cycle time.	[ ]	[ ]	[ ]

Record total cycle count.	[ ]	[ ]	[ ]
Check rack condition, magnets, program configuration.	[ ]	[ ]	[ ]

Qualitative Readings	1st	2nd	3rd	Comments
Main Pump	____L1	____L2	____L3	
Secondary Pump	____L1	____L2	____L3	
Blowers	____L1	____L2	____L3	
Heaters	____L1	____L2	____L3	
DS Door	____L1	____L2	____L3	
CS Door	____L1	____L2	____L3	
Pressure Transducer P1	Empty: _____VDC			
	Dynamic: _____VDC			
	Overflow: _____VDC			
Heating Tank Time	_____ °C/min			
Drying Temperature	_____ °C			
Software version/number	_____			
Water Hardness ppm/gr	CW: _____ HW: _____			
pH	Wash: _____ Neut: _____			

Legend:

N/A-Not Applicable
C-Cleaned
G-Greased or Lubricated
I-Inspected Functioning Properly
M-Missing
CAR-Corrective Action Required
F-Filled
L-Loose
P-Pass
R-Replaced

Notes: _____

_____

_____

_____

Pending Items: _____

_____

_____

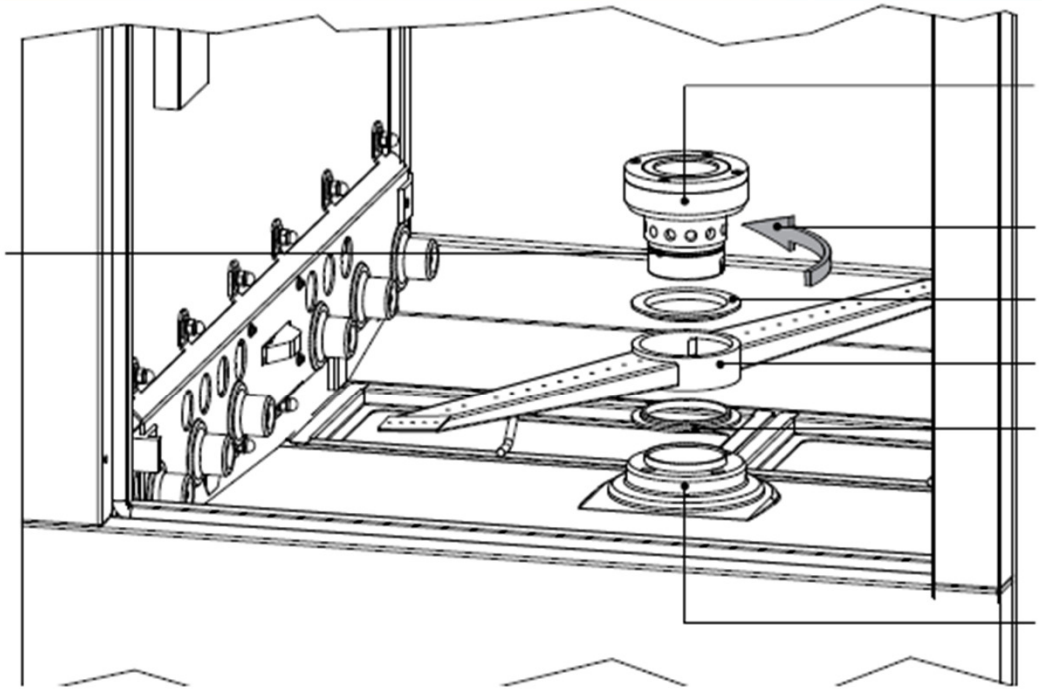
_____

Inspection Complete:

FSE: _____ Date: _____

Total time: _____ hours

Wash are disassembly



- Twist the clamp bearing (Fig. 177 Pos.1) counter-clockwise and pull it upwards
- Dismount remaining components
- Check the clamp bearing seal (Pos.7) for damage
- Check wash arm (Pos.4) for clogged nozzles and clean as required
- Clean bearing bushes (Pos.3+5), check for wear and replace as required

  Replacement criteria: Score marks or deep scratches
- Reassemble components

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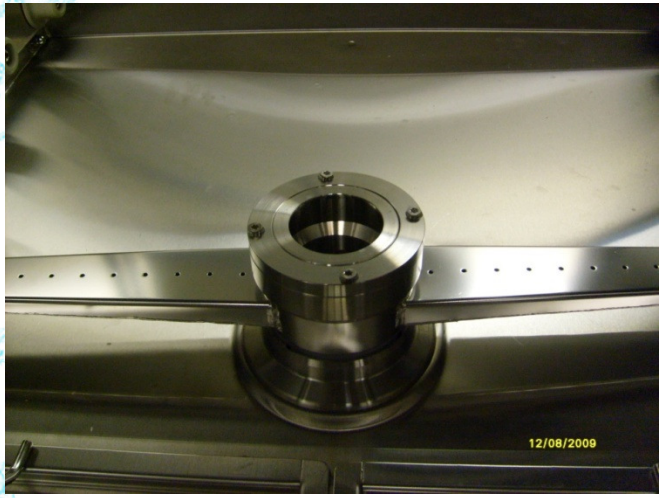
Lower wash arm/docking port



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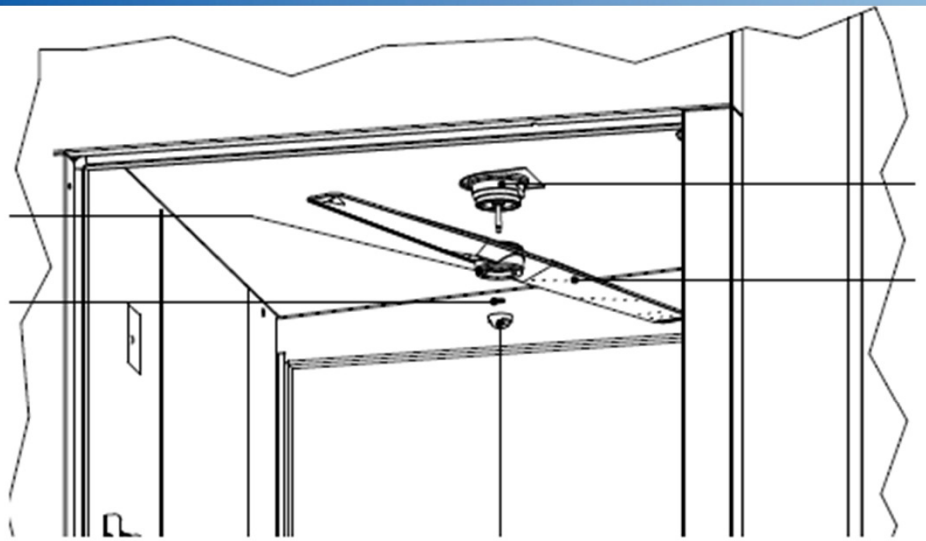
Upper wash arm



- Undo cap nut (Fig. 108 Pos.3)

Note
Do not lose the slide ring (Pos.4)!

- Dismount remaining components
- Check wash arm (Pos.2) for clogged nozzles and clean as required
- Check the rotor bearing (Pos.5) for wear and replace as required

  Replacement criteria: Score marks or deep scratches
- Reassemble components

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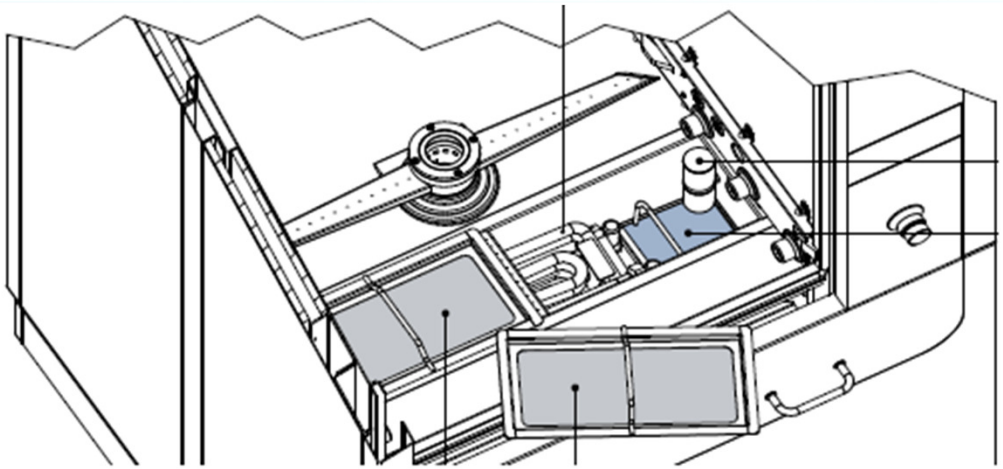
Daily screen cleaning



- Remove fine screens (Fig. 502 Pos.4) and clean as required
- Remove coarse screen (Pos.3) and clean as required

Caution
The tank heating elements can be very hot!

- Remove foreign objects from washing chamber
- Reinsert coarse screen correctly
- Reinsert fine screens correctly

Caution
Never operate the device without fine screens and coarse screen!

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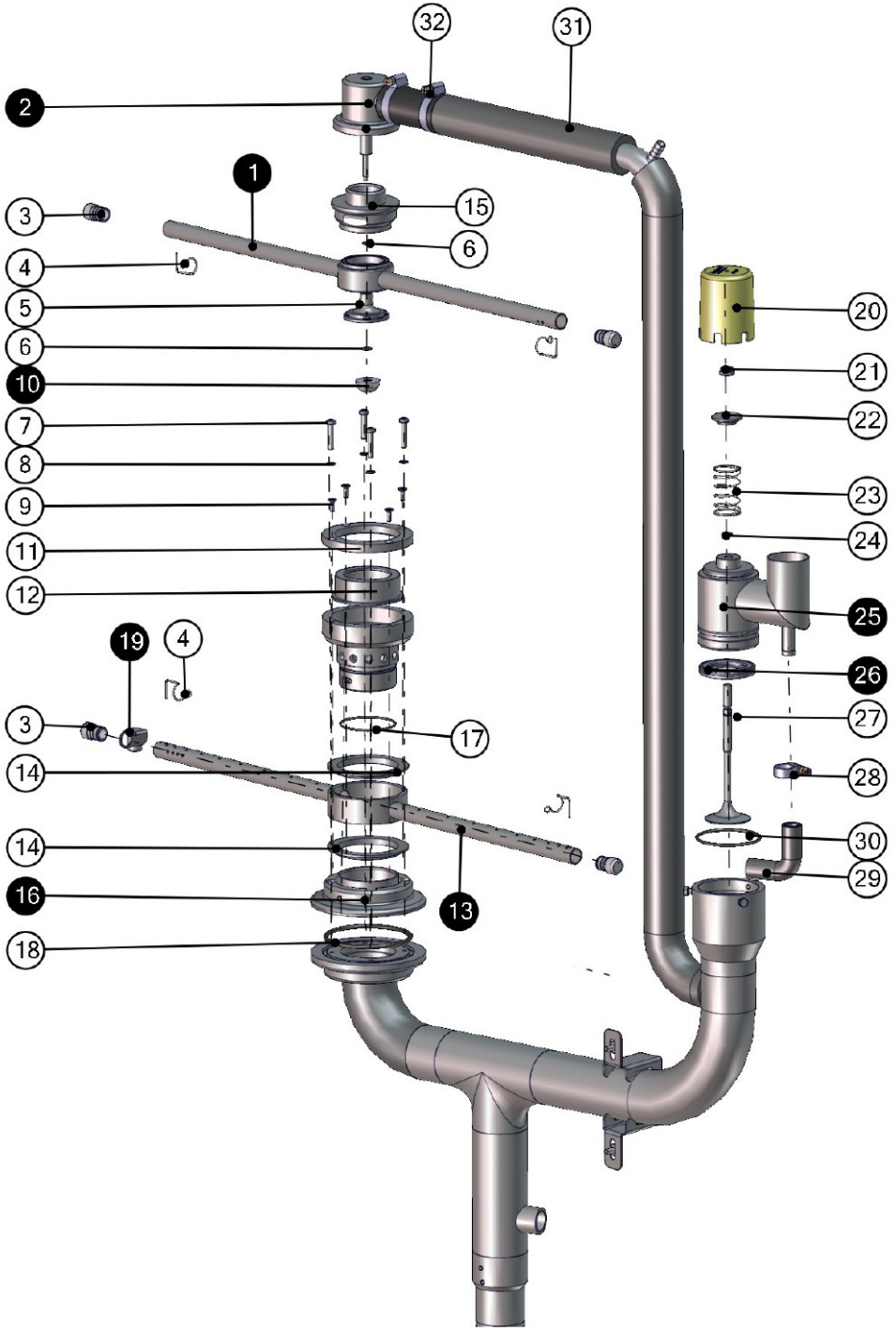
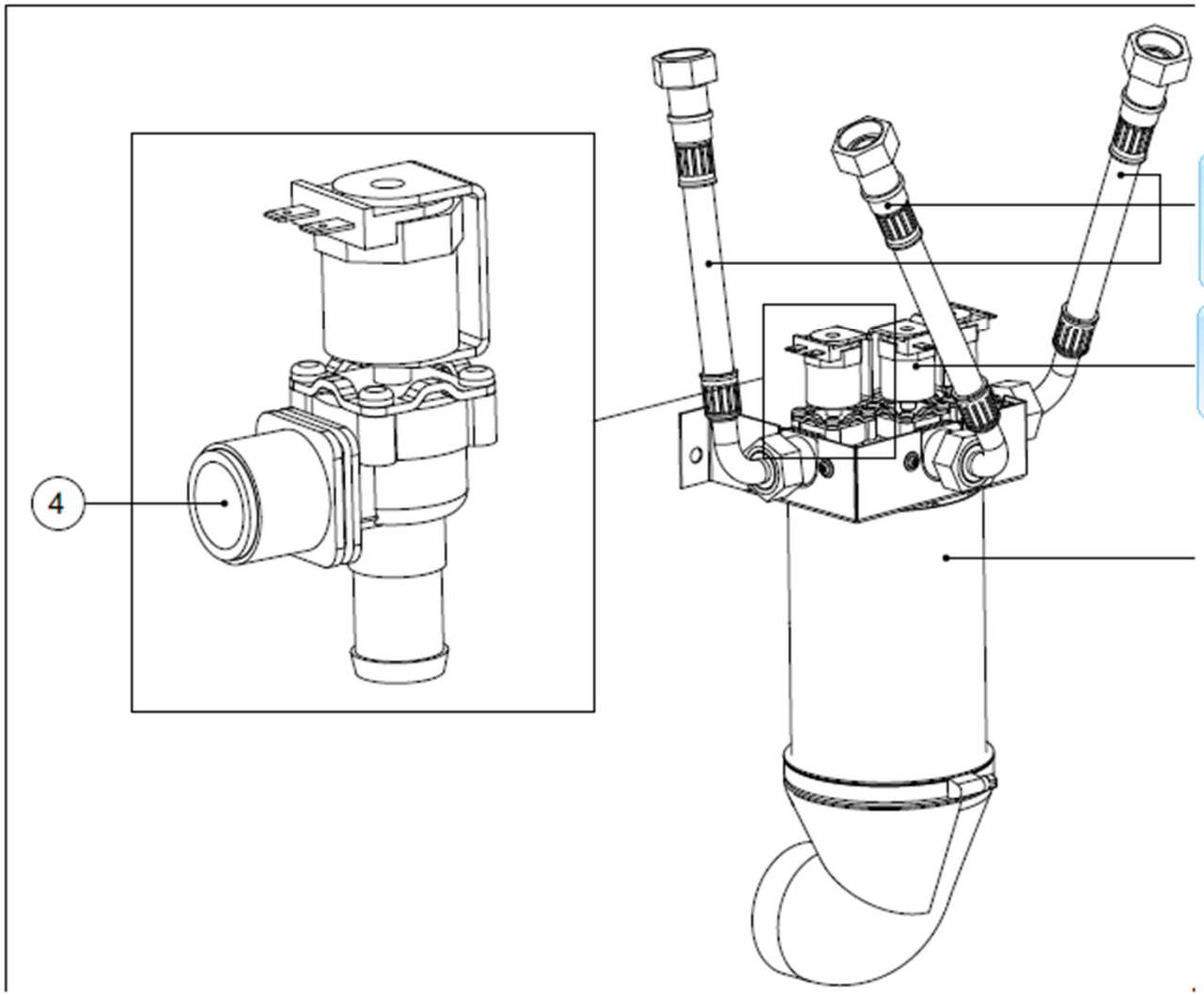
Wash Arm

Position	Item Name	Quantity	Item No.
1	Upper wash arm, welded	1	79509
2	Wash arm bearing, outer Ø25, weld. asse.	1	65966
3	End cap	4	22158
4	Splint pin	4	22257
5	PVDF rotor bearing for wash arm	1	804365
6	Washer Teflon	2	57193
7	Torx fillister head screw 4301, M5x25	4	11741
8	Spring washer 4301 M5 DIN 127B	4	14452
9	Torx countersunk screw 4301, M4x12	3	11690
10	Cap nut	1	30910
11	Flange for clamp bearing	1	73706
12	Coupling piece	1	73705
13	Wash arm	1	79507
14	Bearing bush for wash arm bearing	2	764691
15	Bushing to wash arm 1.4301	1	643076
16	Filler metal for supporting bearing	1	79513
17	O-ring, EPDM, Ø52 x 2.0 70 Shore A	1	21374
18	O-ring, FPM, Ø80x4mm	1	21370
19	Magnet holder for lower wash arm, WRC-NG	1	643286
20	Protecting cap	1	644770
21	Lock nut 4301 M8 DIN 985	1	13665
22	Flange for magnet	1	66051
23	Pressure spring for drain	1	15379
24	Locking ring for shaft D8x0.8 DIN 471	1	15028
25	Valve Unit WD 290	1	645075
26	Seal for non-return valve, with lips	1	66086
27	Valve tappet for non-return valve	1	66082
28	Tube clamp, 12-20mm, width 9mm	1	19181
29	Pre-formed hose for valve	1	47704
30	O-ring, FPM, Ø60x2.62	1	21298
31	Insulating tube, 9mm	1	06117
32	Tube clamp, type SX-9-G Ø25-40	1	19076



Water supply strainers



Pos. 1 - There is a strainer located in the unions.

Solenoid

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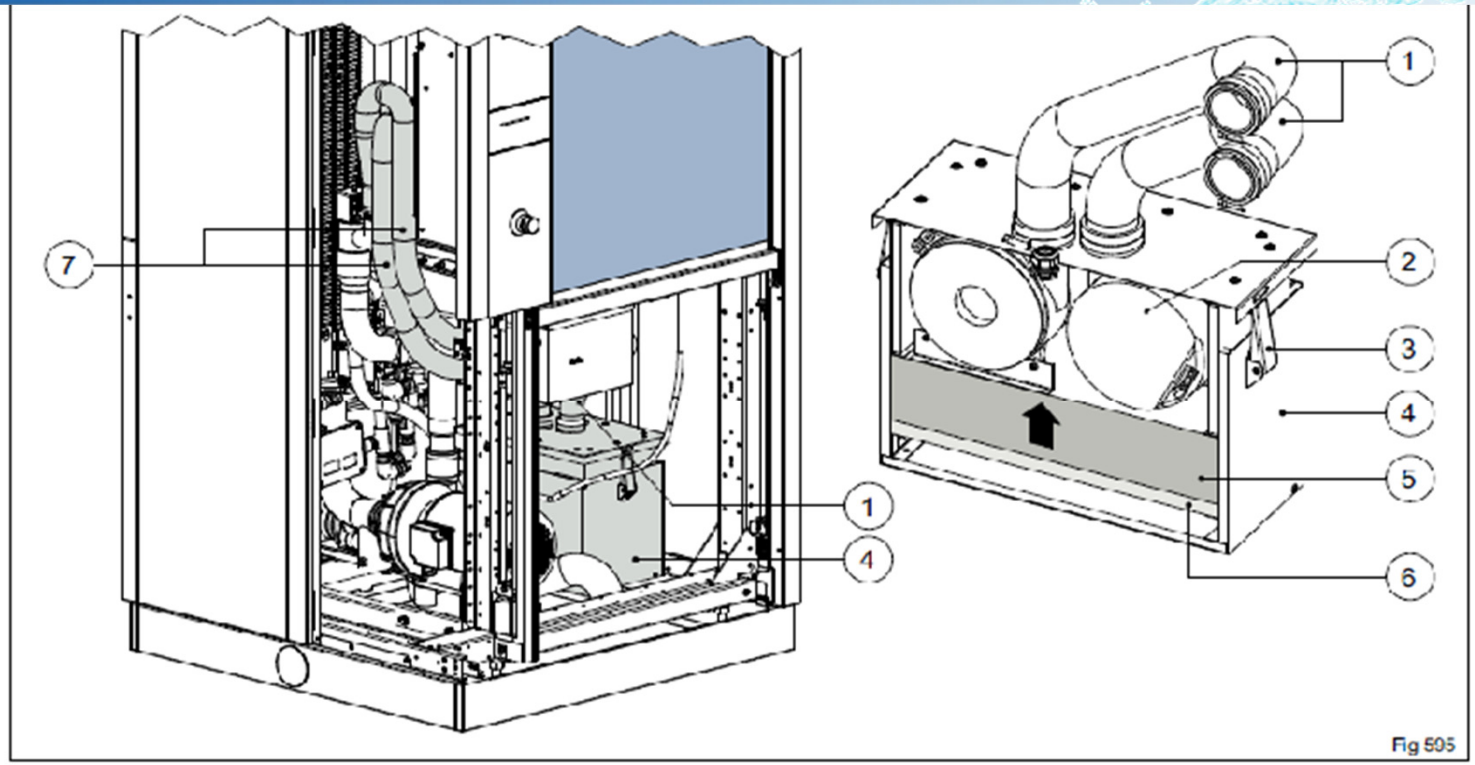
Air HEPA & pre-filter



1 Lower air tube
2 Dryer fan
3 Tension lock
4 Dryer assembly
5 Fine filter
6 Pre-filter
7 Upper air tube

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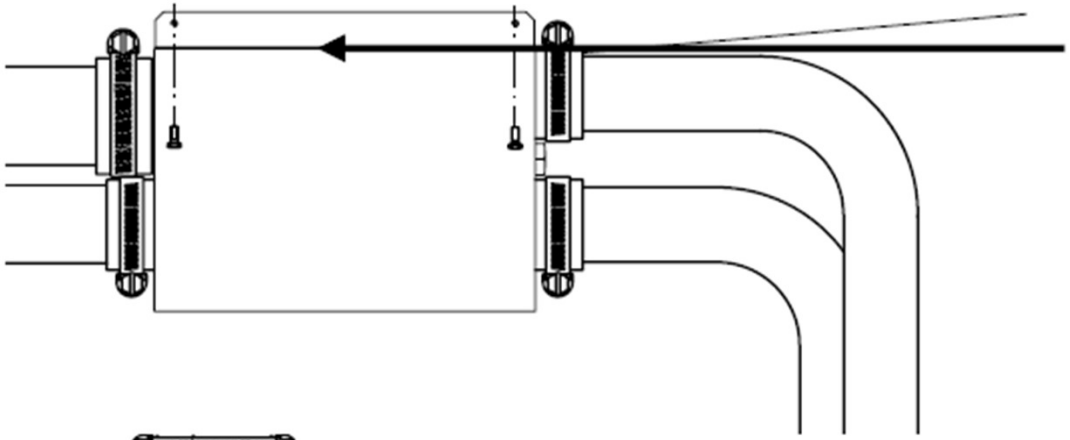
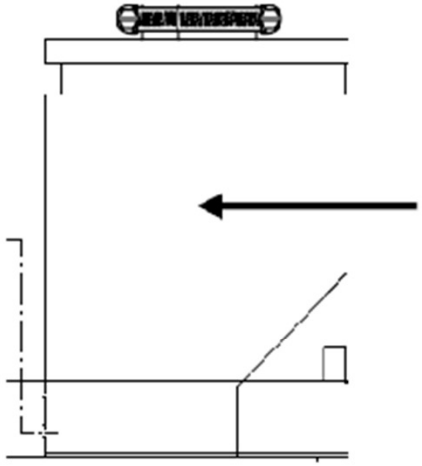
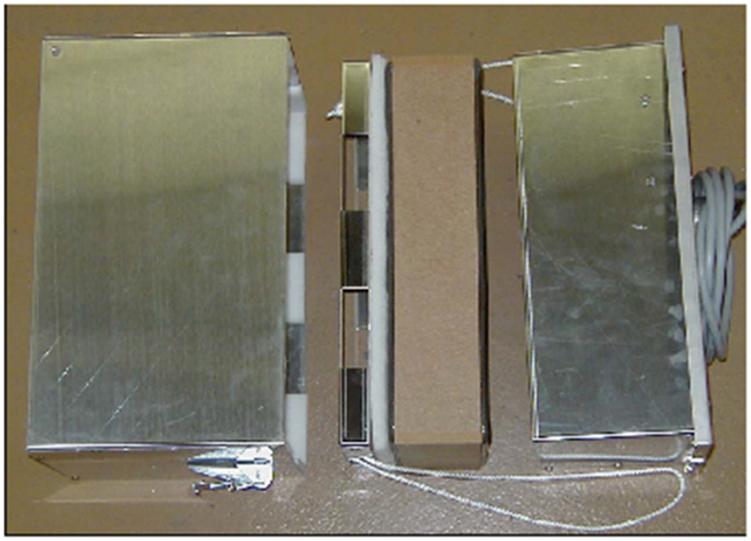
Drying system



Over time, the sealing system on the heat box is getting pushed out and need to be returned to the original position. Caution, there is a pressure switch inside the heater box (P18).



Replace **main filter** (77317) after **about 500 h of service, pre-filter** (74422) **after about 300 h** of service.



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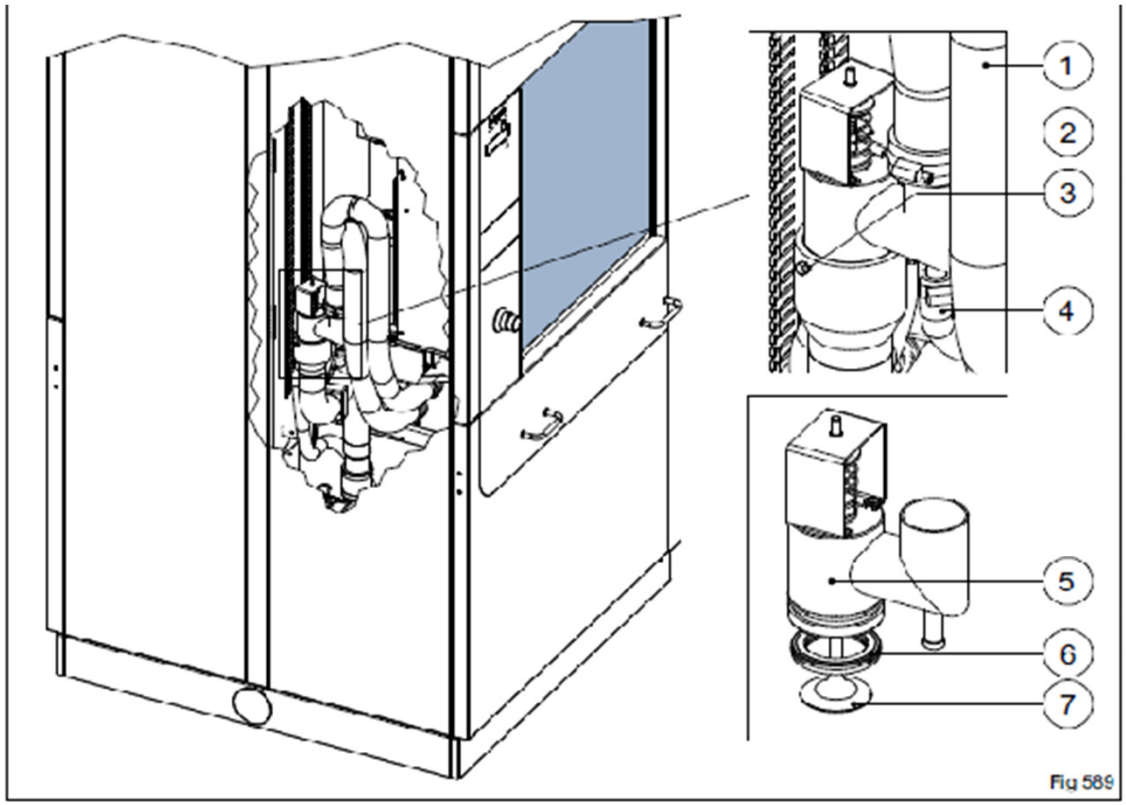
Air/water check valve



1 Air tube
2 Compression spring
3 Valve body locking screw
4 Formed tube
5 Valve body
6 Seal for non-return valve
7 Valve tappet

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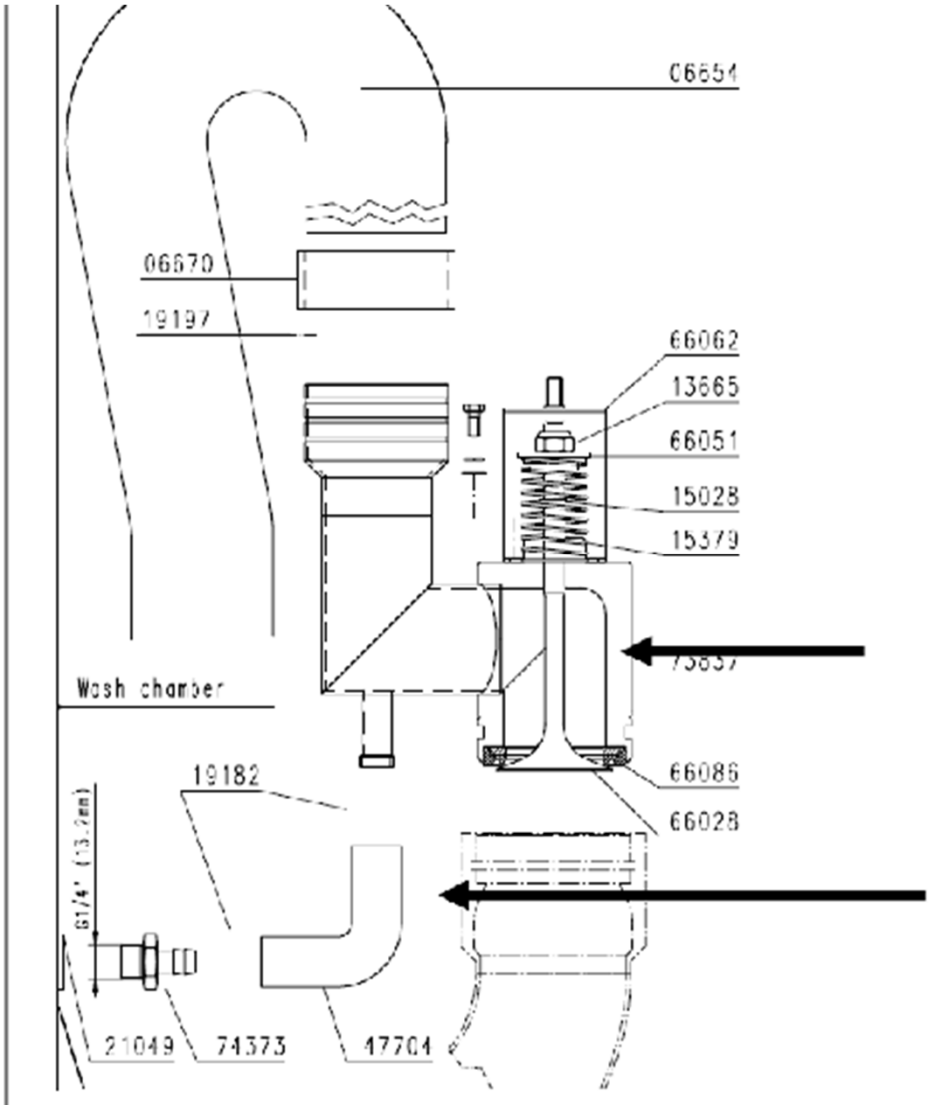
Air/water check valve



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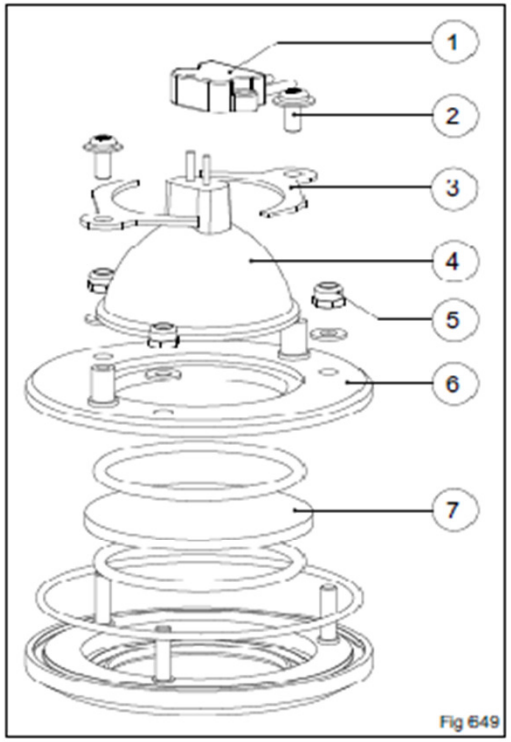
Light bulb



1) Lamp socket
2) Screws for lamp fixture
3) Lamp fixture
4) Lamp
5) Locking nuts
6) Flange for glass
7) Glass

- Pull out lamp socket (Fig. 649 Pos.1)
- Undo lamp fixture screws (Pos.2) and remove lamp fixture (Pos.3)
- Remove lamp (Pos.4) and replace if necessary
- Undo locking nuts (Pos.5) and remove flange from glass (Pos.6)
- Check glass (Pos.7) for contamination and scratch marks. Check sealing rings for injuries as well
- Reassemble components

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Belimed Preventive Maintenance Kits

Have confidence that your maintenance is being performed in accordance with manufacturer's recommendations

Our relentless pursuit of excellence returns true value to our customers.

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Let Belimed take care of your PM Maintenance Plan.

- We use OEM parts to ensure optimal performance of your equipment.
- We'll make sure your equipment is reliable by following a properly scheduled preventive maintenance schedule.
- Establishing PM schedules, ongoing inspections and testing to identify areas in need of repair, are required to meet many industry, state and Federal guidelines.

Calibration Kits are also available from Belimed Service.

For ordering or quoting information, contact Belimed Service 1-800-457-4117 Option 2

Part Number	Description
PMPK-008	559VS1 PM Pack
PMPK-009	559VS2 PM Pack
PMPK-010	66x VS1 PM Pack
PMPK-011	66x VS2 PM Pack
PMPK-012	96xx HS1 PM Pack
PMPK-013	96xx HS2 PM Pack
PMPK-005	CS720/ES387 PM Pack (w/Hoses)
PMPK-004	CS720/ES387 PM Pack (w/Seals)
PMPK-007	CS721 PM Pack (w/Hoses)
PMPK-006	CS721 PM Pack (w/Seals)
PMPK-014	GR96xx HS1 PM Pack
PMPK-015	GR96xx HS2 PM Pack
PMPK-002	WD250_230 PM Pack w Plast Hub
PMPK-003	WD250_230 PM Pack w SS Hub
PMPK-001	WD290 PM Pack

Belimed Infection Control

Your feedback is important

Tell us what you thought of the following areas:

Area of review	1 = did not meet expectations 10= exceeded expectations	Comments
Pre course sign-up	1 2 3 4 5 6 7 8 9 10	
Provided Materials	1 2 3 4 5 6 7 8 9 10	
Class room	1 2 3 4 5 6 7 8 9 10	
Lab	1 2 3 4 5 6 7 8 9 10	
Hotel	1 2 3 4 5 6 7 8 9 10	
Transportation	1 2 3 4 5 6 7 8 9 10	
Breakfast and lunch	1 2 3 4 5 6 7 8 9 10	

Please use the space below to provide any additional information

On behalf of Belimed worldwide, thank you for your feedback!

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Infection Control